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INTEGRATED INFORMATION SYSTEM (IIS)

PART I - SYSTEM REQUIREMENTS

Vol. 2 - System Design Description

NOVEMBER 15, 1967

Prepared for

NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER

First Report of Task Order No. 17

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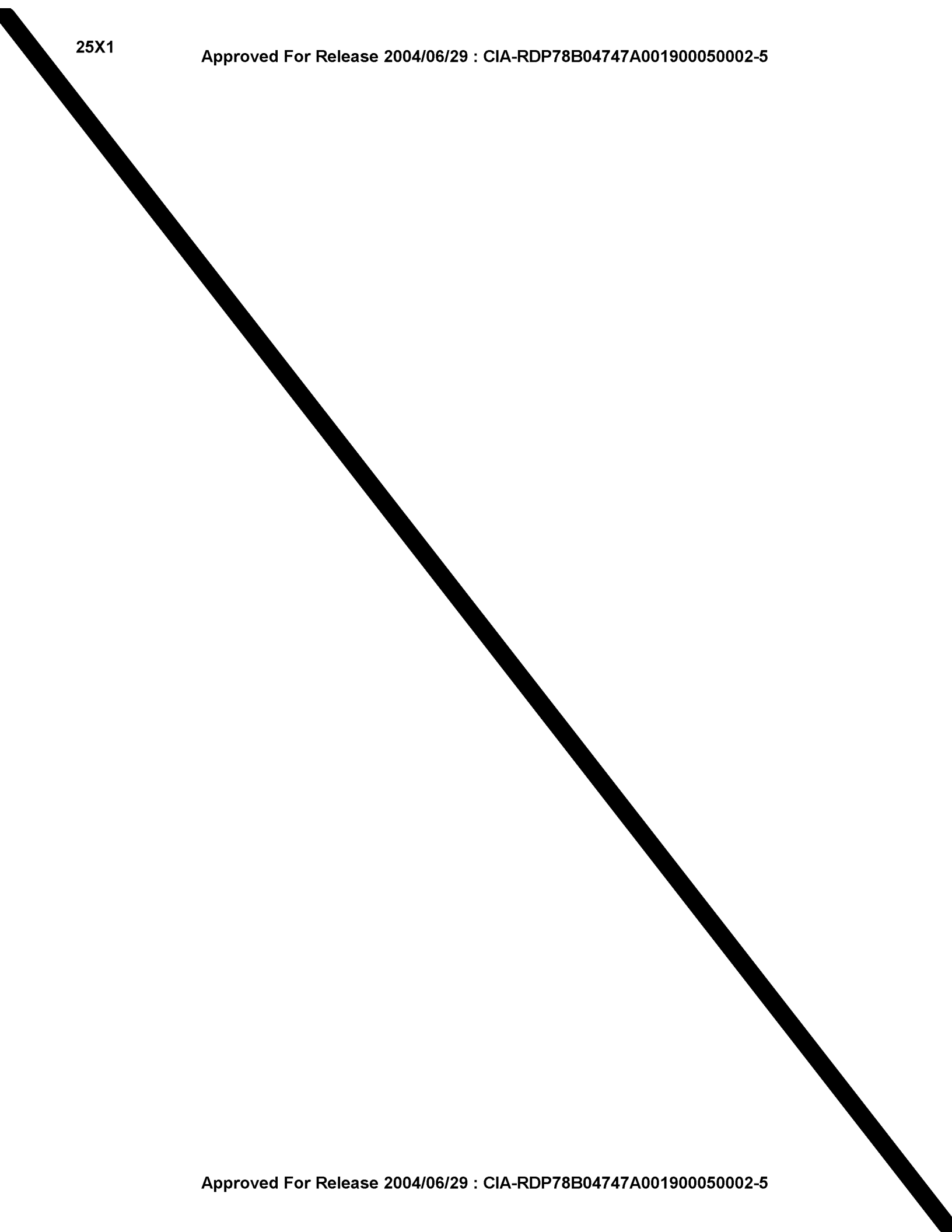

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VOLUME 2

SYSTEM DESIGN DESCRIPTION

1. INTRODUCTION

1.1 Scope

Volume 1 of this report presented the basic design parameters upon which the Integrated Information System (IIS) is based, discussed the costs and benefits to be derived from various potential methods of system implementation, the considerations which led to the selection of a particular design and the comparative costs of the IIS and an extrapolation of current NPIC capabilities to meet the same workload. This volume is devoted to a detailed description of the proposed system in terms of the hardware, software and files required to support it. We shall also present here the detailed background material used in the design process to identify the types and quantities of hardware necessary for efficient system operation and to ascertain the specific computer programs and files which must be generated.

Since the IIS is basically an information system, we have also provided, in a companion volume, a definition of each of the information interfaces of the system (Volume 3).

It should be noted that these two volumes are intended principally as reference documents to be used during system implementation. As a result, every attempt has been made to insure their completeness, albeit at the expense of including a level of detail, particularly in the information interfaces, which may appear to be trivial.

It is not anticipated that the average reader will examine these two volumes in detail but rather that he will concentrate on the particular "Activity" or "Function" of Section 3 which is of primary interest to him and from the reference numbers on the "Information Flow Diagrams" determine what interfaces, consoles, and computer programs are employed in that activity or function. The combination of these various elements is then indicative of how this function differs, if at all, from present practice, in its IIS implementation.

1.2 Organization

Figure 1 is a schematic representation of the procedure used in the development of this detailed system description. The IIS can be considered, in the gross sense, to be a "black box" in which a fixed set of inputs is processed and transformed into a required set of outputs. The inputs are received, in most cases, from sources external to NPIC and are not directly

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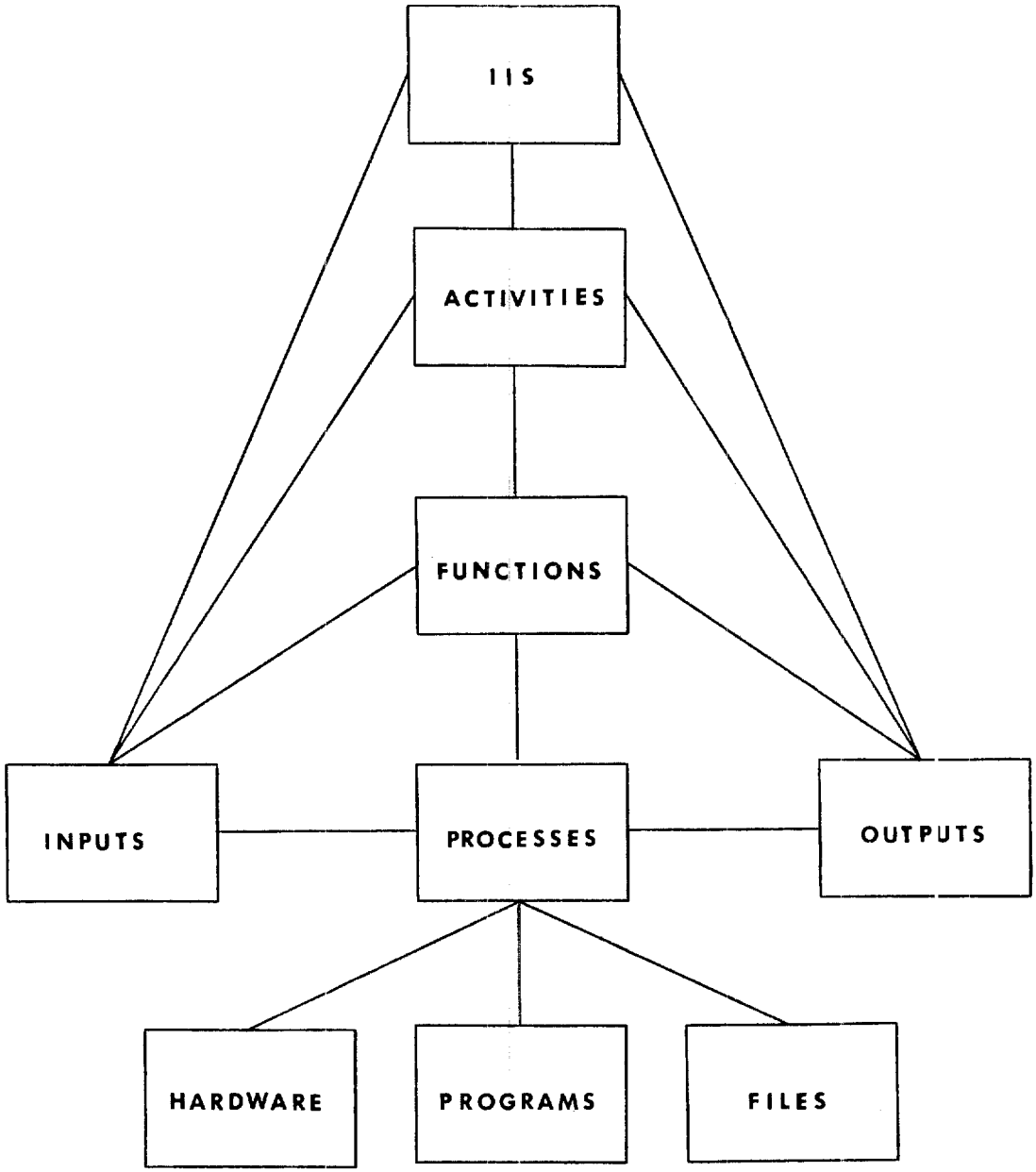

Figure 1 Design Procedure

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subject to Center control as to content or format. These are established by USIB and hence must be considered as constraints on the system. There are, however, a limited number of system inputs which are necessary to effective-system operation and will be generated by NPIC personnel. The form and format of these inputs have been designed specifically to serve IIS needs. The outputs of the system are the products by which the Center communicates the results of its activity to the intelligence community, although the active participation of the IIS in the preparation of these products may be complete at some point prior to the printing and/or distribution of final results. A complete description of IIS inputs and outputs is found in Section 2.

The IIS must be considered as an integrated system because, within its domain, a large number of interdependent activities are carried on concurrently. Each of these activities is, in a sense, a subsystem with its own inputs and outputs. These inputs and outputs may be those of the total system but more generally represent information interfaces with other activities. The activities may in turn be considered as collections of functions linked together by information interfaces and each function further divided into processes, either manual procedures (possibly console assisted) or computer programs. The processes are also linked by information transfers, although at this level of detail some are too trivial to be worthy of explicit definition. The activities, functions and processes which make up the IIS, the workloads on the computer and other hardware of the system which each implies and the basic files which they utilize are shown in the charts and text of Section 3. The information interfaces between activities, functions and processes are described in Section 4. (Section 4.2, which contains the interface forms, has been bound as a separate document so that cross reference between the interface descriptions and the flow diagrams of Section 3 will be simplified.)

The detailed data on equipment utilization, computer programs and file requirements are then summarized and a system configuration which will satisfy these loads and requirements is presented in Section 5.

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2. SYSTEM INTERFACES

The IIS is linked with other elements of the intelligence community through transfers of information, either textual or pictorial. The external inputs to the system are primarily photographs and information about the location and conditions under which the photography were made with some additional textual information from other intelligence sources. In addition to this substantive information, effective system performance requires that limited amounts of control, "house keeping" and resource availability information also be provided as inputs.

The outputs of the IIS are basically the products by which the Center communicates the results of its efforts to elements producing finished intelligence. These outputs may again be either textual or graphical in form and in some instances a combination of both.

2.1 System Inputs

Most of the inputs to the IIS are generated by sources external to NPIC and are generally in a form and format approved by USIB. Although we anticipate that these inputs may change with the passage of time, we would expect such changes to be transitional rather than revolutionary and that small programming adjustments will be sufficient to adapt the system to these changes. We have, therefore, used current external inputs for design purposes.

The inputs to the IIS which will be generated within NPIC are principally in the form of lists of resource availability and control information and can be established as IIS requirements.

2.1.1 Inputs from External Sources

2.1.1.1 Imagery

Although never actually processed or altered by the IIS, photographic imagery forms one of the principal information sources of the system. A large portion of the textual information which is eventually entered into the National Data Base is a verbal description of the content of the imagery resulting from the human interpretation process.

At the present time, virtually all of the imagery is in the form of aerial photographs made by reconnaissance aircraft or orbiting vehicles. In the future, other systems embodying infra-red sources or side-looking airborne radar may produce imagery for interpretation. Additionally, we anticipate the possibility of direct readout vehicles transmitting digitally represented imagery which will be reconstituted on the ground before entry into the system.

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A limited volume of ground photography is also provided to the Center but, except in the case of photographs of objects from which photogrammetric measurements can be made, is used principally for reference purposes.

During the lifetime of the IIS, continuing improvements in photographic resolution and the introduction of new films and camera systems are anticipated. The effects of such changes have been reflected in the system workloads in terms of increased numbers of targets in the data base and increased workloads during target readout. However, these changes will not alter the basic activities of the IIS which use imagery as an input.

The basic content of the imagery is pictures of specific targets or objects of intelligence interest. The form varies with the camera system utilized and includes vertical and oblique frame, panoramic and strip photography. These variations are felt principally in the activities dealing with the photogrammetric measurement and target prediction.

2.1.1.2 Position and Attitude Information

a. Data Available Prior to Film Arrival - KH-4

Data available for a KH-4 mission prior to film arrival at NPIC is received via the 1004 data link and cable. A pre-mission data link transmission contains the pre-programmed data to which the KH-4 system is set prior to launch. Daily transmissions over the data link consist of an Operations Summary and Ephemeris Data for a 24 hour period of the mission. The camera on-off frame numbers arrive by a cable. When a mission is complete, all previous Operations Summary daily transmissions are repeated as one transmission. The same is done for the Ephemeris Data.

The APF, a high accuracy ephemeris refined and adjusted for the whole mission is also received via the 1004 data link.

(1) Operations Summary

The operations summary contain two parts, a Performance Estimate and a Photographic Summary. The Performance Estimate contains the following information:

Mission Number
Camera
Revolution Number
Program Number
Operation Number
Frame Count Estimate Between the Specified On-Off Times

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The following items are oriented to on-off time, i.e. there is a value at camera-on and another at camera-off.

Latitude and Longitude of Camera Principal Ray
Vehicle Height in Feet Above Sea Level
Slant Range of Camera Principal Ray in Feet
Greenwich Mean Time - Days, Hours, Minutes, Seconds
Local Time at Point Where Camera is Looking
System Time in Seconds, Modulo 86,400 secs./day
Line Identifier for the Tape Format

(2) Photographic Summary

The photographic summary part of the operations summary contains the following information:

Camera Number
Slit Designation
Filter Designation
Film Designation
Revolution Number
Program Number
Operation Number
Number of Frames
Number of Feet of Film
Exposure Time in Seconds
Solar Elevation at Center of Format
Solar Direction of Format Center where 0^{o} is the Direction of Motion of the Vehicle

The following items pertain to film processing and are defined as the Minimum Exposure Requirements for Aerial Scenes of Average Luminance:

Exposure Value
Full Processing Level
Intermediate Processing Level
Primary Processing Level

(3) Ephemeris Data

The ephemeris data transmissions contain the following information:

Run Number
Mission Number
Revolution Number

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Date
Vehicle Number
Greenwich Mean Time (H, M, S)
System Time in Seconds, Modulo 86,400 secs./day (same as Performance Summary)
Geodetic Latitude and Longitude (on Hough Ellipsoid)
Height in Yards to Hough Ellipsoid
Radial Distance in Yards to Center of Hough Ellipsoid
Right Ascension in Degrees and Minutes
Inertial Velocity - Velocity Vector Referenced to Center of Hough Ellipsoid
Flight Path - Angle made by Velocity Vector and a Line Parallel to a Tangent to the Earth at Nadir
Azimuth - Angle Between Velocity Vector and Local Meridian of Longitude, N = 0^{o}, E = 90^{o}, S = 180^{o}, W = 270^{o} Degrees and Minutes
Geocentric Latitude - Angle Between the Intersection of the Radial Line from the Geometrical Center of the Hough Ellipsoid to the Vehicle with the Equatorial Plane. Degrees and Minutes

The ephemeris data transmissions also contain the following information for each revolution (these are called "Element Slugs"):

Epoch - Time of New Revolution Start, H,M,S (GMT)
Longitude of Ascending Node - Longitude in Degrees at Epoch Measured West from Greenwich
Inclination - Angle Between Orbit Plane and the Equatorial Plane Measured Counterclockwise from the Equator to the Orbit Looking Down on the Ascending Node (deg.)
Eccentricity of the Ellipse Approximating the Orbit $\frac{(Ap - Per)}{(Ap \& Per)}$
Period - Time in Minutes Between Ascending Nodes of the Approximating Ellipse
Decay - Rate of Change of Orbit (Seconds/Day)
Perigee - Distance in Yards from Center of Mass of the Earth to the Lowest Point in the Orbit
Argument for Perigee - Angle in degrees along the Orbit about the Geometric Center of the Hough Ellipsoid Measured from the Ascending Node in the Direction of Flight to Perigee
Apogee - Distance in Yards from Center of Mass of the Earth to the Highest Point in the Orbit

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(4) On-Off Frames

The camera on-off frames are received via cable (TWX) which lists frames included in the on-off segments of a revolution, along with data on edited frames, cut/wrap frames, number of stellar/index frames, etc. The cable format regarding frames included in on-off segments is as follows:

D0002 13, 27, 53, 89

Where: D0002 = Revolution Number (i.e. Descending, Rev. No. 2)
13 = Frames 1-13 pertain to 1st on-off for this revolution
27 = Frames 14-27 pertain to 2nd on-off for this revolution
53 = Frames 28-53 pertain to 3rd on-off for this revolution
89 = Frames 54-89 pertain to 4th on-off for this revolution

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2.1.1.3 Reports for Data Base Entry

The NTP requirement that NPIC maintain a National Data Base of Imagery-Derived Information (NDBIDI) implies that interpretation data from sources external to the Center must be accepted and processed by the IIS. In general, this data will appear in one of two forms:

a) As "field" IPIR's either in cable or hard copy form
b) As hard copy detailed third phase reports

Data from First Phase field interpretation will be used to update the IDF (see Section 3.3.3) as will the installation description from the appropriate detailed third phase reports. Additionally, all hard copy imagery exploitation reports will be indexed in the EPDF.

2.1.1.4 Miscellaneous Field Inputs

In addition to the major substantive information elements described above, there are a number of miscellaneous items which are required for system operation. These include such items as:

a. The Mission Film Cable received from the processing site.

b. Special requirements for Phase III reports which are generated by external agencies.

c. Notices of change in the COMIREX priority of targets.

d. Schedules for the regular updating or initial generation of Phase III reports.

2.1.2 Internally Generated System Inputs

Successful operation of the IIS requires that a certain amount of information which is originally generated manually within NPIC also be entered into the system at appropriate points. This information falls into one of the three classes described in the following paragraphs.

2.1.2.1 File Updating Information

Several special files of non-substantive information are maintained by the IIS to assist in automatic scheduling and file maintenance. Data to update these files is manually generated by NPIC personnel. This information includes:

a. Changes in the target category specialties of the PI team for Phase I readout.

b. Changes in the geographic area specialties of PI teams for Phase II readout.

c. The number of man hours spent by each PI team on Phase I and Phase II readout on each mission. (This can be extracted from MIS data).

d. Instructions for the destruction and/or archiving of film in the film library

e. Gross criteria which can be used to screen field reports for credibility. This will be a printed list rather than an electronic file since the screening is a manual operation.

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2.1.2.2 Material to Support Image Interpretation

Various forms and files are required to assist the PI in image interpretation. These include:

a. Blank Worksheets for use in Phase I and Phase II readout, including those developed specifically for IIS purposes and the existing cable worksheet

b. New Target Forms

c. Various hard copy files, some of which may be indexed in the IIS.

These include:

1) CSD Target Folders
2) Support Material maintained in the PI room
3) The CSD reference library

An internal request for a Phase III detailed report also appears as a system input and, in a sense, may be considered as supporting image interpretation since it specifies precisely what is to be included in the interpretation.

2.1.2.3 Material for Reports

While for the most part, the material included in the output products of the Center will be generated directly by, or with the assistance of the IIS, there are two groups of items which fall outside that realm.

a. Manuscript material, such as the prefaces to certain reports and the highlights in Phase I reports

b. Processed photography for use as briefing boards or as attachments to reports.

2.1.2.4 Miscellaneous Inputs

Also appearing in the Information Flow Diagrams of Section 3 and shown in Table XL of Section 4 are a variety of miscellaneous inputs which include such things as:

a. Requests for information (via COINS)

b. Requested Documents (from Library or other sources)

c. Replies to queries made by NPIC personnel.

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2.2 System Outputs

The outputs of the IIS are the recorded results of imagery interpretation and may be either textual or graphical in form. Although the contribution of the IIS essentially ceases when information in an appropriate format has been generated, it is most convenient to consider the system outputs as the "Product Set," i.e. the reports, briefing aids, cables, etc. by which the Center communicates the results of its efforts to the intelligence community as a whole.

The set of products which are described in the paragraphs below were first proposed in Study Task A(1)c of [redacted] and have been accepted by the Center as "encompassing the reporting requirements (i.e. content, schedule, format and organization) likely to be levied on the Center." 25X1A

This acceptance was given and the products incorporated into the design with the full understanding on the part of both the Contractor and the Center that requirements can and will change with the passage of time and that inherent in the IIS must be the flexibility to adapt to such a change.

2.2.1 Textual Outputs

2.2.1.1 Individual Target Reports

The basic result of imagery interpretation is a report on the status of a specific target, photographs of which have been interpreted ("read out") by a PI. The results of his work are recorded on a PI Worksheet (see Section 4.1.2) and after approval (see Section 3.1.4) become the "Individual Target Report." This report is made available to the intelligence community in four different forms:

a. Insertion in the Installations Data File

Immediately upon completion of the approval cycle, the Individual Target Report is used to update the appropriate unit record of the Installations Data File (IDF) where it is available to all users having query capability aginst the system, i.e. "in-house" users with query consoles and COINS participants. With the file updating procedure, the report, per se, loses its individual identity except as the entries in the various sectors of the file are tagged with the proper mission and film references.

b. Computer Link Transmissions

The IIS will include a computer-to-computer link to those intelligence groups in the Washington, D. C. area which maintain machine-readable data bases requiring imagery derived information. This group of users will be

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essentially the same as those comprising the COINS network. Selected sections of the Individual Target Reports (i.e. the data which is amenable to a taxonomy and is usually reported with a numeric qualifier, particularly OB and other variable data about installation facilities) will be transmitted over this secure communications channel as soon as the IDF has been updated.

The format of the report, when transmitted over this computer link, will be as agreed by the participating organizations. The content will be as shown in Table I.

TABLE I

INDIVIDUAL TARGET REPORTS - COMPUTER LINK CONTENT

Data Element	Average No. of Characters
Mission Number	5
Target Number	5
Header	70
OB Data	1500
Variable Installations Data	300

c. Cables

When imagery interpretation shows some element of unusual intelligence importance, the Individual Target Report may be distributed as a "Flash" cable. In this case the basic Worksheet is accompanied by a cable text which is also entered into the system and is subjected to the same approval cycle as the report itself. As soon as the text is approved, a punched paper tape for transmission and a printed copy for verification are generated in the communications center.

The content of the report in this form is as shown in Table II.

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TABLE II

INDIVIDUAL TARGET REPORTS - CABLE CONTENT

Data Element	Average No. of Characters
Mission Number	5
Target Number	5
Header	70
Film Reference	60
Description of Target (changes only)	100-200
OB Data	50-250
Variable Installations Data	200-500

d. Briefing Boards

When an individual target readout shows elements of sufficient intelligence importance to apparently warrant production of a briefing board, the complete target readout (i.e. all of the information used to update the IDF) will be printed out for manual editing and selection by the Briefing Board Coordinator.

2.2.1.2 Collected Target Reports

Periodically, the Individual Target Reports are assembled for distribution to the intelligence community. This service is particularly required for those users who do not have access to the information through COINS or the Computer Link. It also provides a set of permanent, hard copy reference documents covering the results of image interpretation on a specific mission. The design of the IIS provides for the production of three of these collections of Individual Target Reports.

a. First Phase Report

This report is a collection of the Individual Target Reports for all active priority COMIREX targets which have been interpreted after the receipt of mission imagery.

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b. First Phase Report Supplement

Individual Target Reports for all active non-priority COMIREX targets which have been read out on the mission are collected in this document.

c. Significant Change Report

Information derived from the initial interpretation of non-COMIREX targets during the area scan procedure is always stored as Individual Target Reports in the IDF and hence is available to COINS users. In addition data concerning new targets, significant change to existing targets and OB data is distributed over the Computer Link. For the benefit of intelligence community users not served by the stored information, a collection of these significant changes is prepared and distributed by cable.

The First Phase Report and First Phase Report Supplement are produced by the IIS as mats for printing and as paper tapes for cable transmission. Sterilized versions of these reports for distribution to selected foreign governments are also produced. Within the collections, the Individual Target Reports are ordered alphabetically by installation name, country and target category and are accompanied by certain supplementary material including mission plots, photographic attachments and deployment tables as appropriate. The content of these reports as they appear in bound document form is shown in Table III.

TABLE III
CONTENT - FIRST PHASE REPORT AND SUPPLEMENT

Data Elements	Average No. of Characters	
Table of Contents	80/target	
Preface	1000	
8 x 10 Mission Plots	N/A	
Highlights	1000	
Individual Target Reports (250-450/PhaseI)(750-1100/Supplement)		
Mission Number	5	
Target Number	5	
Header	70	Per
Film References	60	
Target Description (changes only)	100-200	Target
OB Data	50-250	Reported
Variable Installation Data	200-500	
Attachments	N/A	
Deployment Tables	N/A	
Index to Targets	80/target	

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The cable versions of these reports contain only the Highlights and the Individual Target Reports.

The Significant Change Report is produced only as a tape for cable transmission and contains only the collected Individual Target Reports exhibiting the necessary significant change charactersitics. A sterilized version is also generated.

2.2.1.3 Basic Intelligence Support Exploitation Report

This basic report is described in the NTP as an authoritative base report which would be augmented by information derived from subsequent First and Second Phase reporting. It is a detailed Third Phase report resulting from an in-depth study of imagery covering a particular subject of intelligence interest and will be updated on a regular schedule or as required by significant new information or changes in community interests. It may appear either as a Brief or as a multi-page detailed report. In either case, the mats for the printing of the textual material are produced with IIS assistance. Much of the material in the report is extracted directly from the on-line data base or from magnetic tape copies of earlier reports on the same subject and editing of the report is an on-line activity. The content of the report in Brief format is shown in Table IV and in the multi-page format in Table V.

TABLE IV

BASIC INTELLIGENCE SUPPORT EXPLOITATION REPORT CONTENT

(BRIEF FORMAT)

Data Element	Average No. of Characters
USIB Header	70
Photo References	60
Collateral Data References	120 - 750
Target Description	150 - 900
Good Quality Halftone of Photography	N/A

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TABLE V

BASIC INTELLIGENCE SUPPORT EXPLOITATION REPORT CONTENT

(MULTI-PAGE FORMAT)

Section	Data Elements	Average No. of Characters
I	USIB Header	70
	Abstract	650 - 900
	Photo References	60
	Collateral References	120 - 250
II	Statement of Periodicity	40
	Location Map	N/A
III	Target Description	Variable
IV	Good Quality Halftone of Photography	N/A
V	Site Plot (annotated as required)	N/A
VI	Table of items visible in IV & V with measurement data	Variable
VII	Chronology and Historical Data	Variable

2.2.1.4 Frame Ephemeris

This report is a computer printout of the contents of the MCD listing for a particular mission except that corrected rather than nominal values for vehicle position and attitude are presented. The entire report will be produced by the IIS. The content is as shown in Table VI.

TABLE VI

FRAME EPHEMERIS CONTENT

Data Element	Average No. of Characters
Preface	up to 60,000
Table of Contents	500 - 600
Mission Constants	
Frame Data (Number of frames is variable)	
Vehicle Time	10/frame
GMT	10/frame
Geo Coordinates of Nadir	15/frame
Vehicle Attitude	6/frame
Velocity	5/frame
Attitude	18/frame
Geo Coordinates of Center of Format	15/frame
Sun Angle	5 /frame

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2.2.1.5 Photo Evaluation Report

A report concerning the photographic effectiveness is prepared by TID for each mission. The IIS will not normally participate in the preparation of this report except perhaps to support on-line editing.

2.2.1.6 Miscellaneous Textual Outputs

As a result of IIS operation there will be various miscellaneous outputs in the form of messages to appropriate NPIC components or to other members of the intelligence community. Included in this set are:

a. The map requirements developed during the Pre-readout Activity for Phase I and Phase II readout support will be sent to CSD so that the map files in the PI area will be complete for each mission.

b. Photo references and notes will be sent to the Photo Lab to request photographic prints for use in briefing boards and as attachments to reports.

c. Miscellaneous requests for information, documents, photography, etc.

2.2.2 Graphic Products

The graphic outputs of the IIS are of two forms, either plots or drawings produced directly by the system to be used as briefing aids or for inclusion in reports, or the by-products of the Film Library Maintenance activity, i. e. film for destruction or film for archiving. This latter class is essentially trivial as far as IIS processing is concerned, requiring only the maintenance of activity records on specific film cans. The former class, however, requires further discussion.

2.2.2.1 Briefing Aids

Two classes of outputs for use in briefing aids will be generated:

a. When a decision to produce a substantive Briefing Board, based on an individual target readout, is made, the list of header material which must be prepared on the Headliner equipment is automatically generated and sent to PD.

b. Mission photographic coverage plots at scales of 1:9 and 1:15 million will be automatically generated for use as map overlays or briefing materials.

2.2.2.2 Material for Reports

Three general classes of graphic outputs for inclusion in NPIC reports will be produced by the IIS:

a. Installation plots* for use in Basic Intelligence Support Exploitation Reports are an output of the Mensuration Support Activity. These are complete and accurately scaled but require additional processing by the Graphics Analysis Branch before finished graphics are available. These plots are simplified and rectified line drawings showing the outlines of buildings, fences and other pertinent structures and their relationship to roads, railroads, streams, lakes or other geographical features.

b. Engineering drawings* for detailed reports about objects of intelligence interest are also a result of the Mensuration Support Activity. Initial point coordinates generated in the measurement process are corrected for camera position relative to the object to obtain rectified orthographic projections (i.e. plan and profile views) of the object. In the initial implementation of the IIS, these will be point plots only and the construction of lines and creation of finished graphics will be a manual process.

c. Analytical charts and graphs of empirical data or representing the results of analytical studies will be produced automatically by the IIS. These will be standard bar charts or analytical curves and will be generated on an "as required" basis. Included in this set will be a large portion of the results of photodensitometric analysis.

* Inputs may be the result of photodensitometer scanning.

2.2.2.3 Miscellaneous Graphic Outputs

The film which enters as a system input must periodically be purged from the film library. Since Film Library Maintenance is an IIS activity, it is obvious that the film must also be a system output. It is described in the maintenance activity (See Section 3.4.2) as:

a. Film for Destruction

b. Film for Archives

3. INFORMATION FLOW

The IIS is an integrated system because it supports, both serially and concurrently, a large number of essentially independent activities which interface with each other through transfers of information. The NPIC activities which require IIS support and their interrelationships are shown in Figure 2. For the most part, these activities are directly related to one of the three principal exploitation mission of the Center:

- Immediate Reporting
- Detailed Reporting
- Provision of a National Data Base

There are, however, some supplementary supporting activities which have somewhat broader application. In the paragraphs which follow, we have, as far as possible, grouped the separately identifiable activities according to the mission of NPIC which they support and have shown a fourth class for the supplementary activities.

Each activity is described in an Activity Information Flow Diagram which breaks the activity down into a set of functions, each of which has certain inputs, outputs and file requirements associated with it. Each function is then further detailed in a Function Information Flow diagram which subdivides the functions into processes, each of which again has its own interfaces.

On both levels of diagram we have used a standard notational system. Information interfaces are shown in ovals, files in diamonds and actions (functions or processes) as rectangles. Both the interfaces and the actions are given reference numbers and processes are additionally tagged with an "M", "M/C" or "P" to indicate whether they are manual procedures, console assisted procedures or computer programs.

The interfaces between activities, functions and processes are described in detail on forms bound in a companion volume. Each form contains a reference number in the upper right hand corner which corresponds to the number above the interface oval on the flow diagrams.

System inputs and outputs have already been described in Section 2 but forms repeating the critical design information about these interfaces are included in Section 4.

Tables showing the files utilized by the activity and the workloads imposed against system components by the activity are provided for each activity with explanatory text where required.

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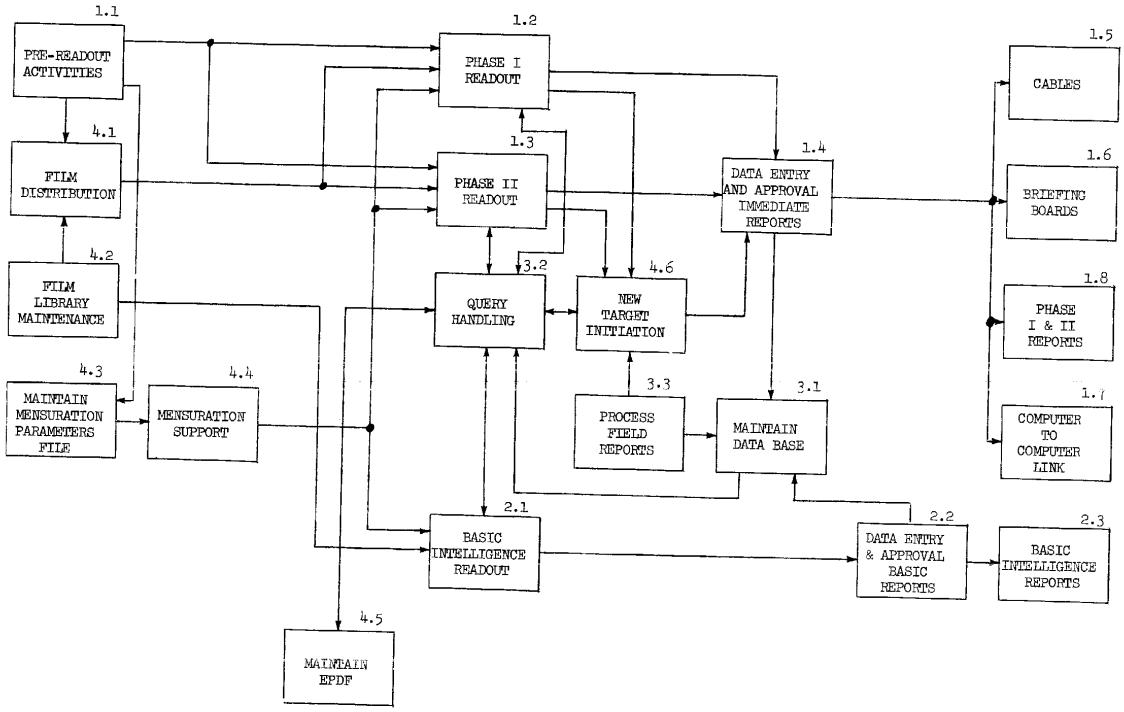

Figure 2 Inter-Activity Relationships

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3.1 Immediate Reporting

3.1.1 Pre-Readout Activity

3.1.1.1 Activity Description

This activity (Figures 3 through 16) is performed to prepare material necessary for PI readout. To accomplish this activity properly, the most recent mission film, target information and IIS file data must be available. The following paragraphs discuss the two major steps in the preparation of this material.

a. Target Prediction

The inputs to the target prediction process differ depending upon the type of mission. All inputs [redacted] 25X1D missions require some preliminary processing before they can be used in the coverage prediction function. This function accepts as input the coordinates of the four corner points of each rectangle of coverage. Information from the index by geo-coordinates (GEOIX) is also used by the coverage prediction routine to obtain the target coordinates and the machine reference number. Other header information is extracted from the IDF at the same time for later use in the IIS mission processing cycle.

Coverage prediction and film coordinate computation have been separated into two functions. This allows some processing to be done with the target lists for KH-4 missions prior to the arrival of data from the processing site which identifies the actual number of frames per coverage rectangle and allows more accurate film coordinate computation.

After the basic tasks of coverage prediction and film coordinate calculation are completed, the list of predicted targets is used by several functions which require various segments and orderings of the basic list. These various sorted lists are not formally considered to be files of the IIS, they are simply tables that are communicated between operating programs via a drum. The two principal predicted target lists are:

1. Sorted Phase I Targets, ordered by readout team and priority

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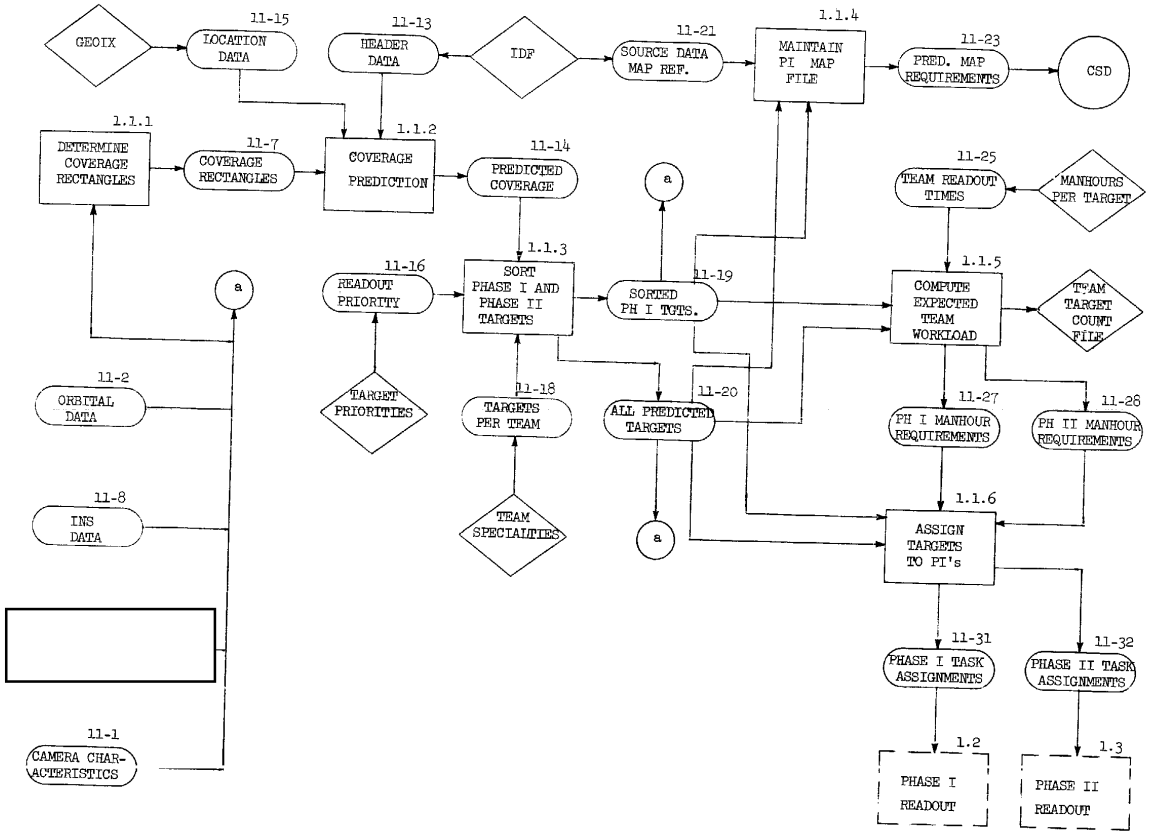

Figure 3 1.1 Pre-Readout Activity

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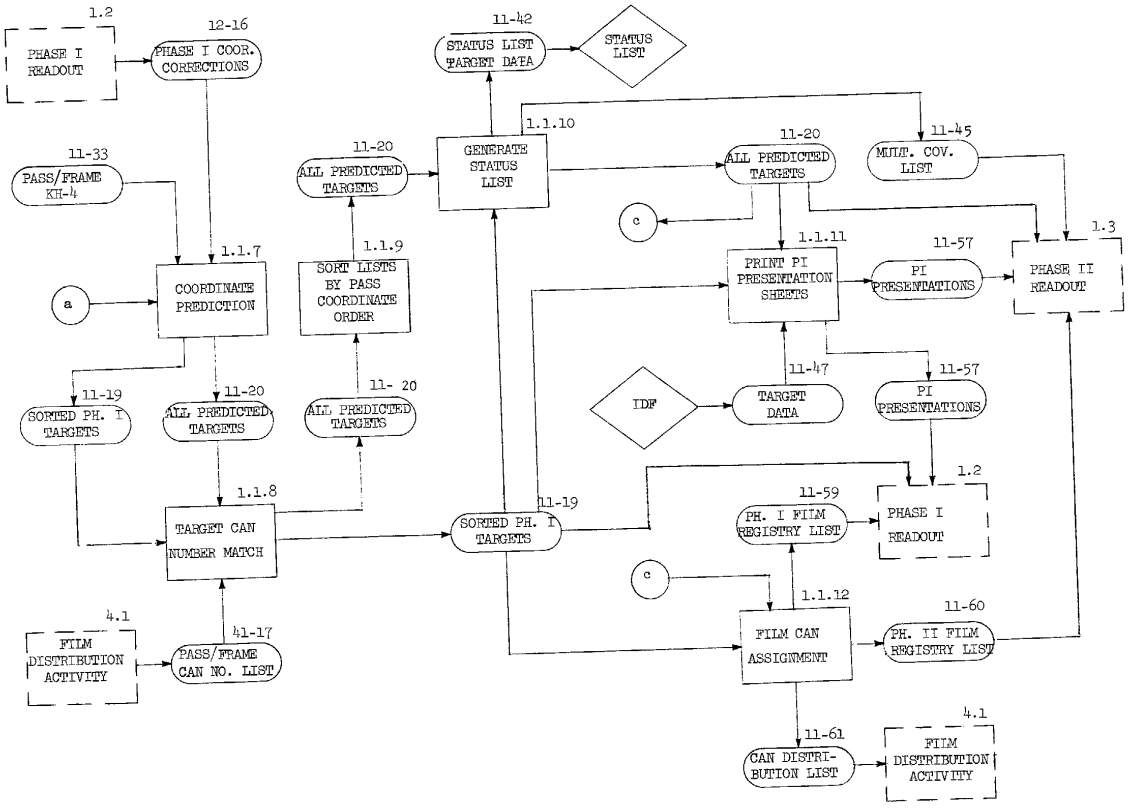

Figure 3 (cont'd) 1.1 Pre-Readout Activity

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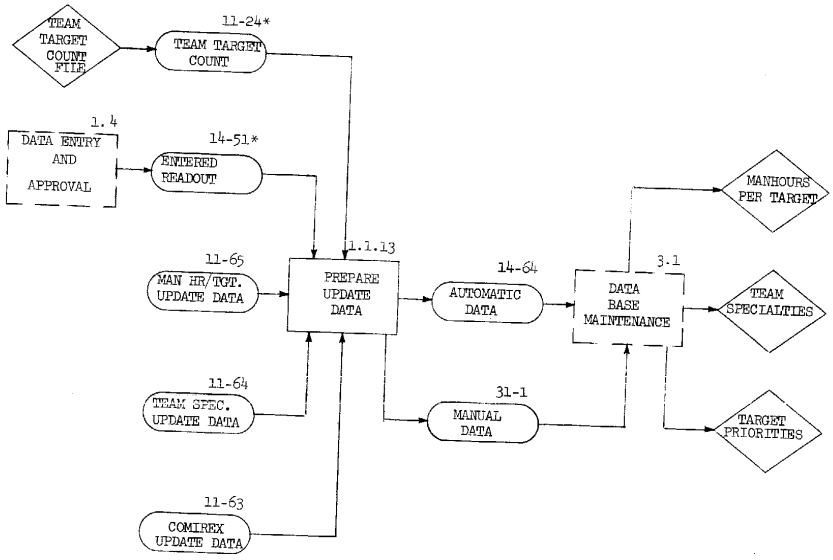

* From previous mission

Figure 3 (cont'd) 1.1. Pre-Readout Activity

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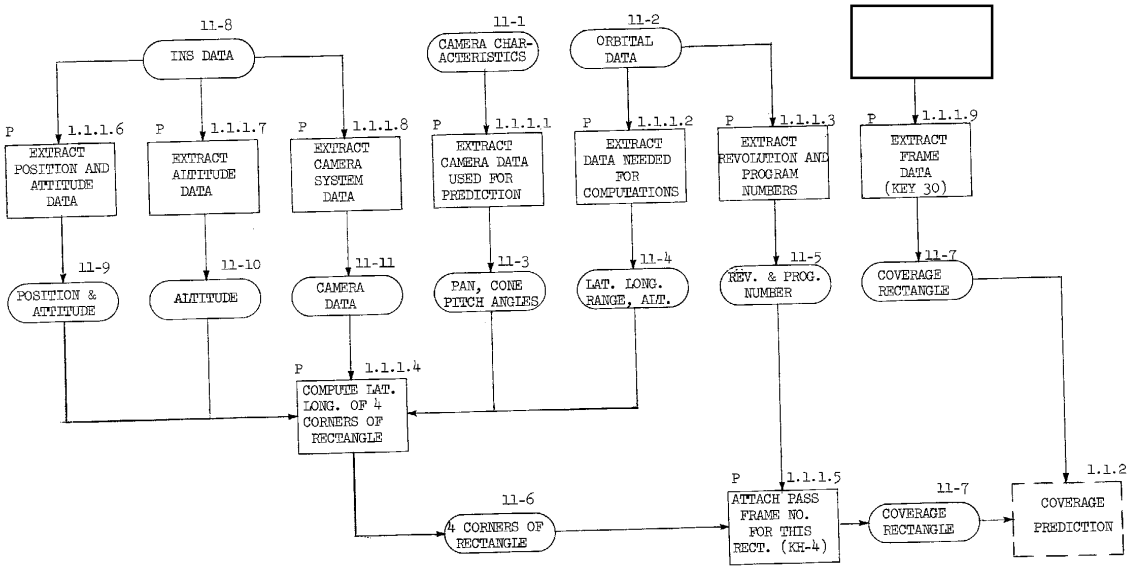

Figure 4 1.1.1 Determine Coverage Rectangles

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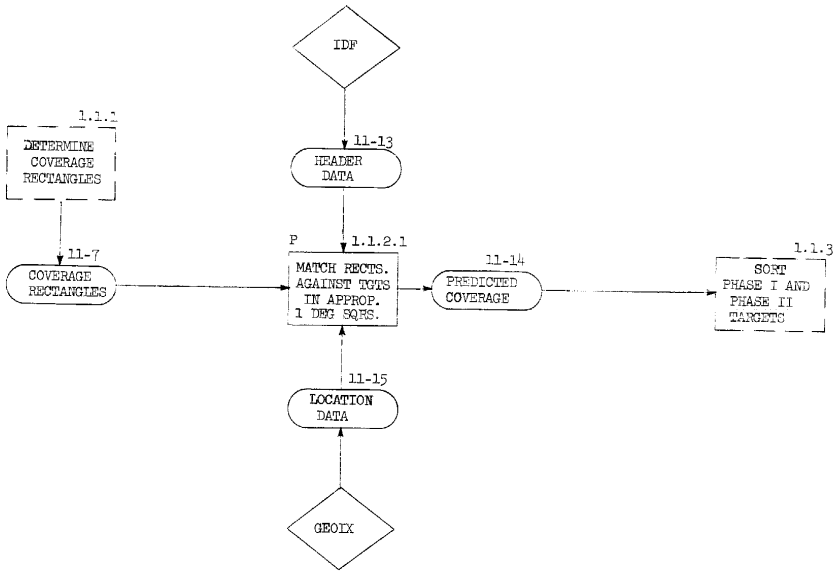

Figure 5 1.1.2 Coverage Prediction

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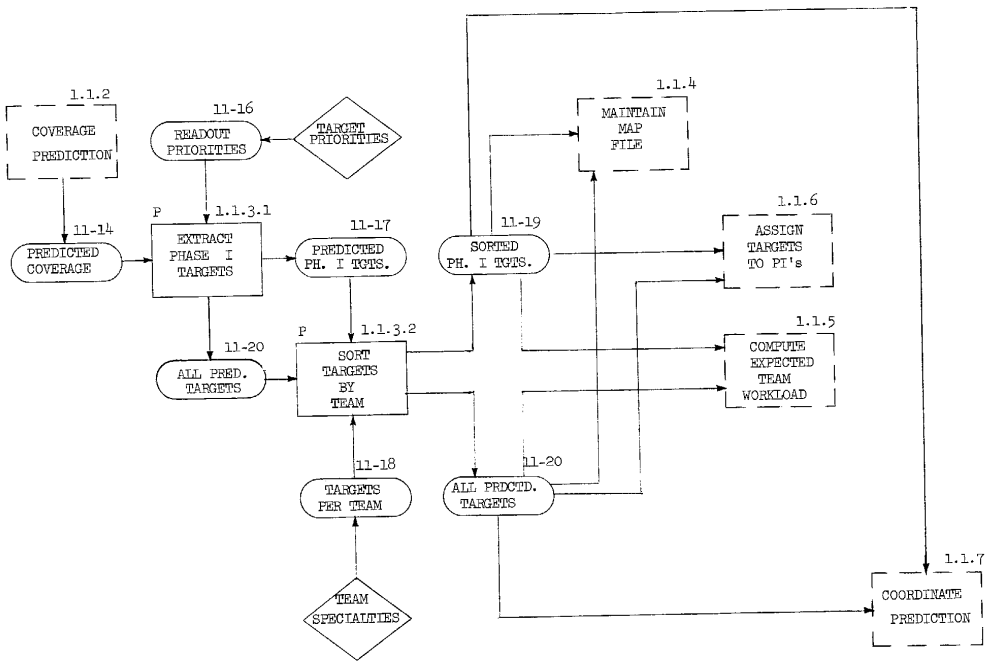

Figure 6 1.1.3 Sort Phase I and Phase II Targets

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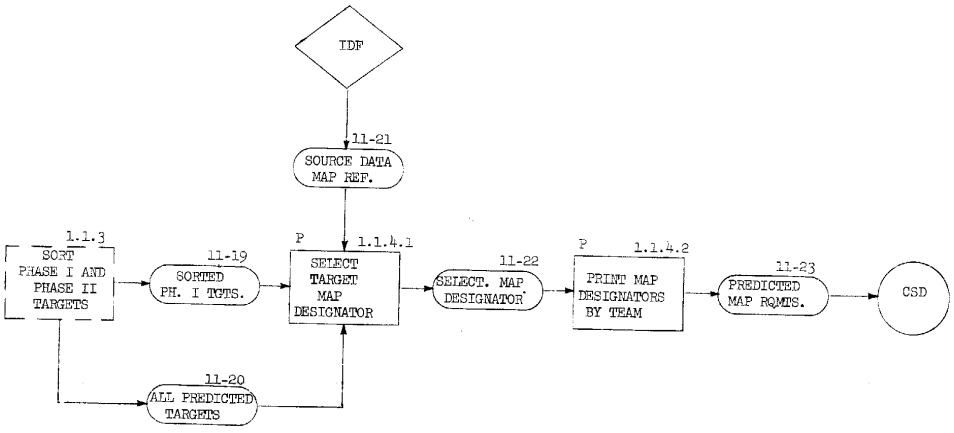

Figure 7 1.1.4 Maintain PI Map File

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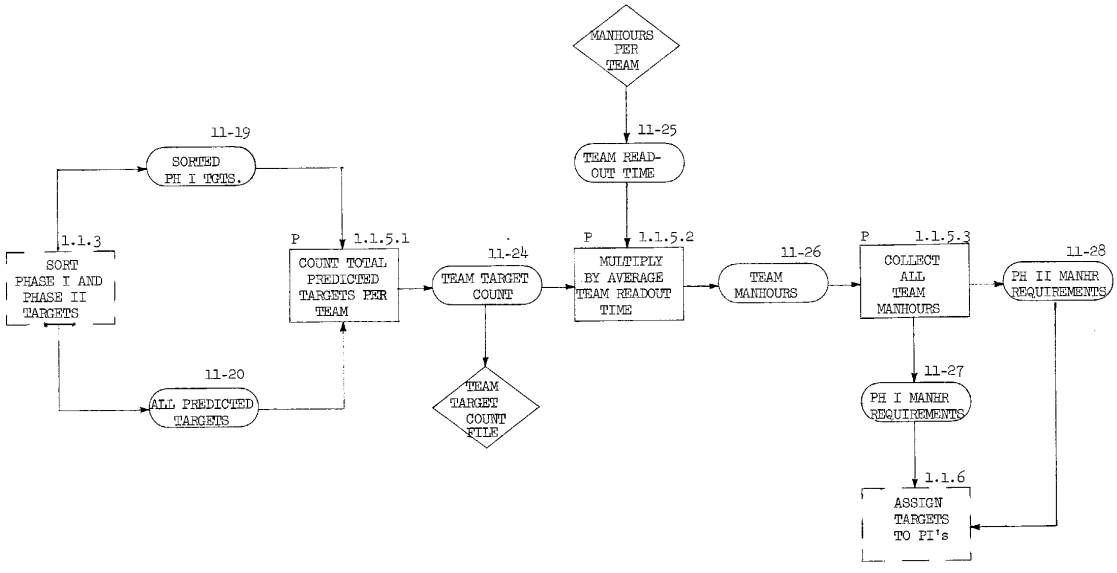

Figure 8 1.1.5 Compute Expected Team Workloads

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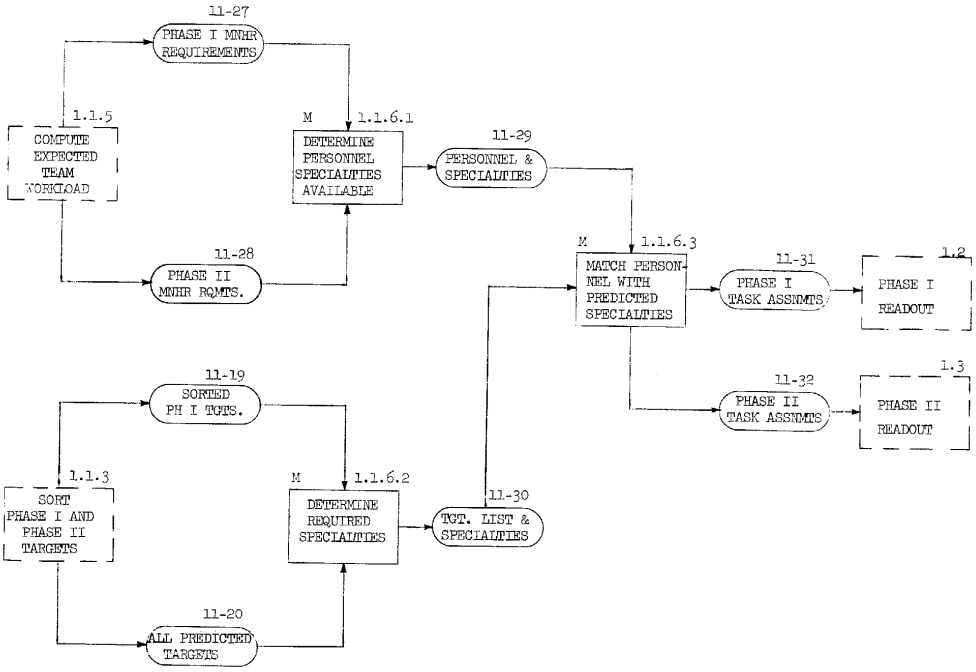

Figure 9 1.1.6 Assign Targets to PI's

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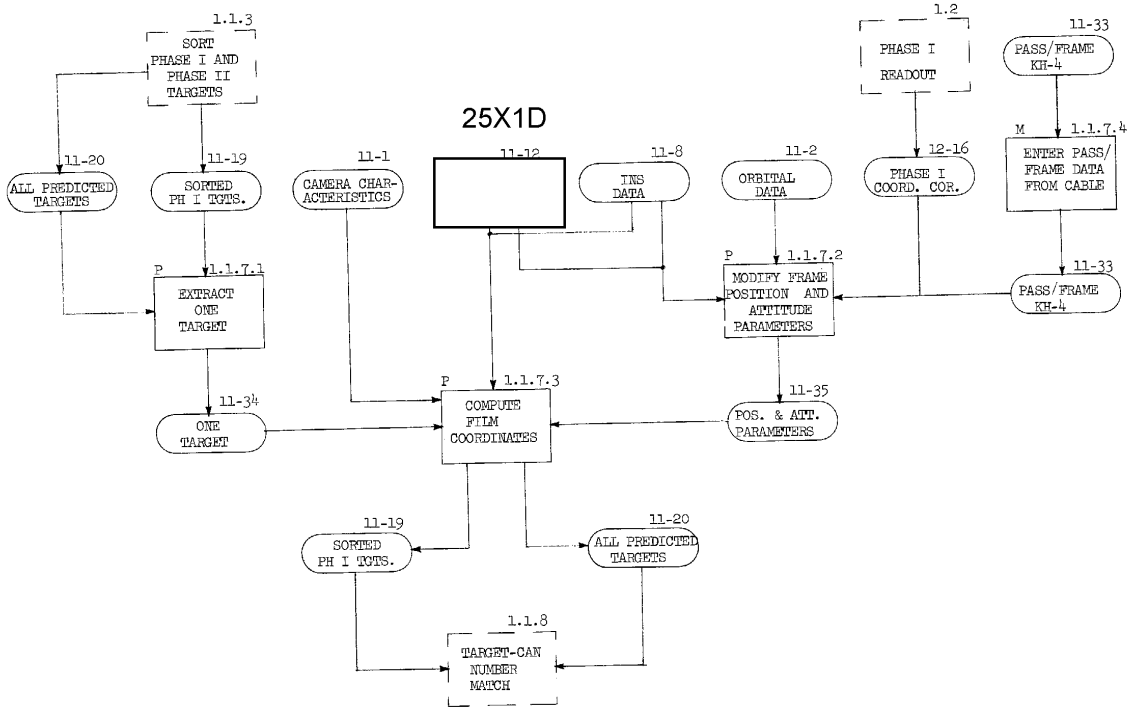

Figure 10 1.1.7 Coordinate Prediction

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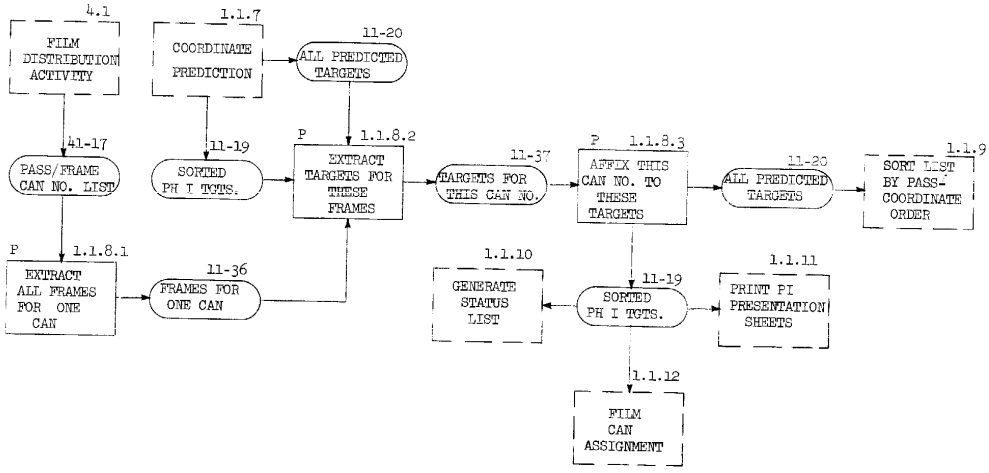

Figure 11 1.1.8 Target/Can Number Match

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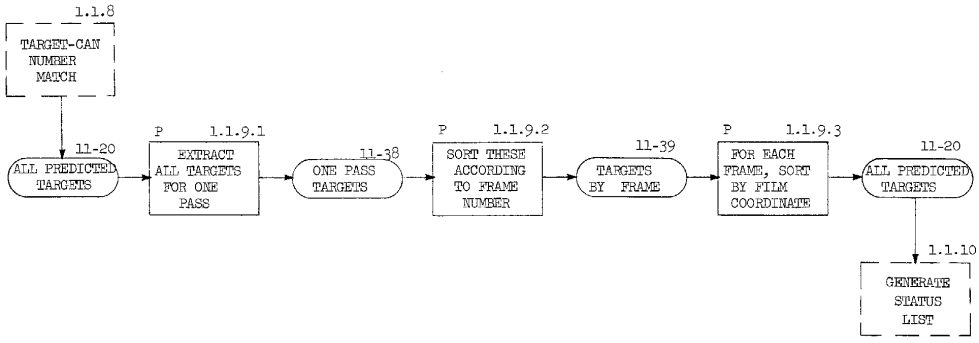

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Figure 12 1.1.9 Sort List by Pass Coordinate Order

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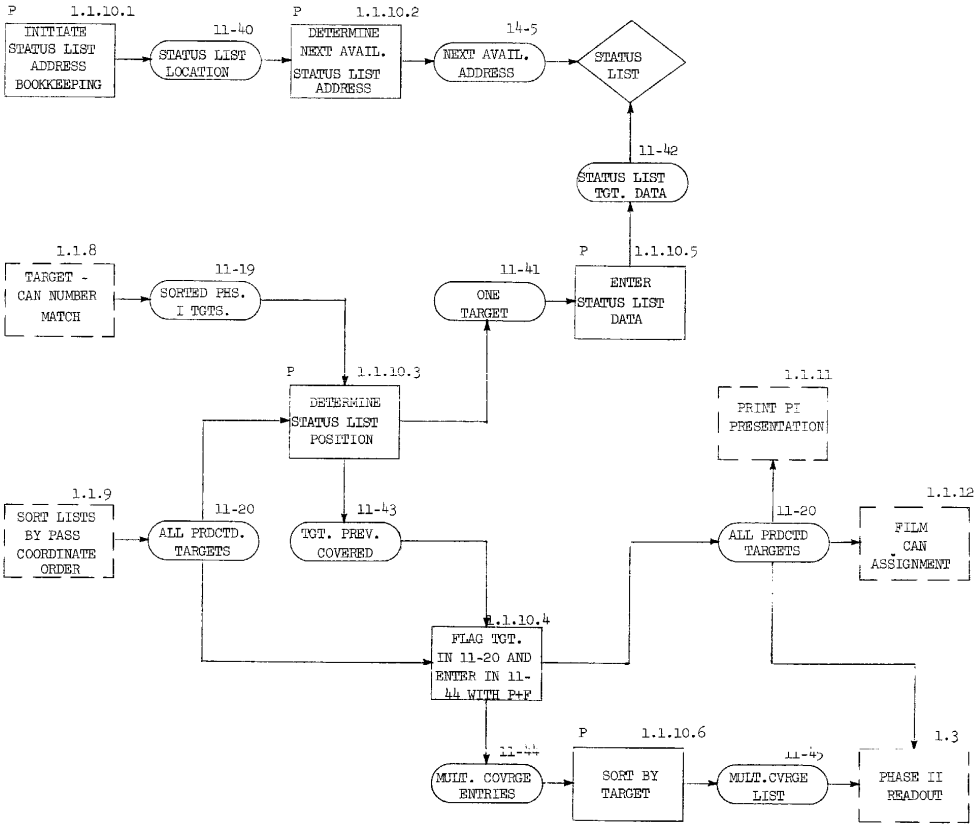

Figure 13 1.1.10 Generate Status List

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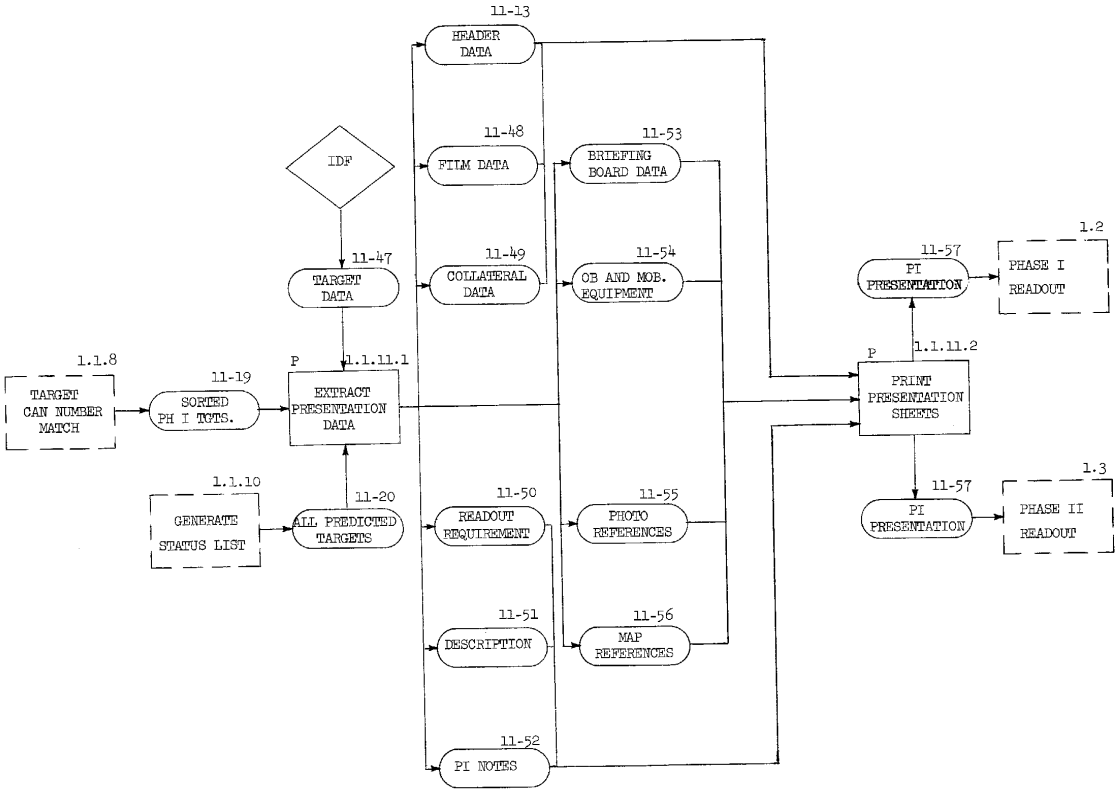

Figure 14 1.1.11 Print PI Presentation Sheets

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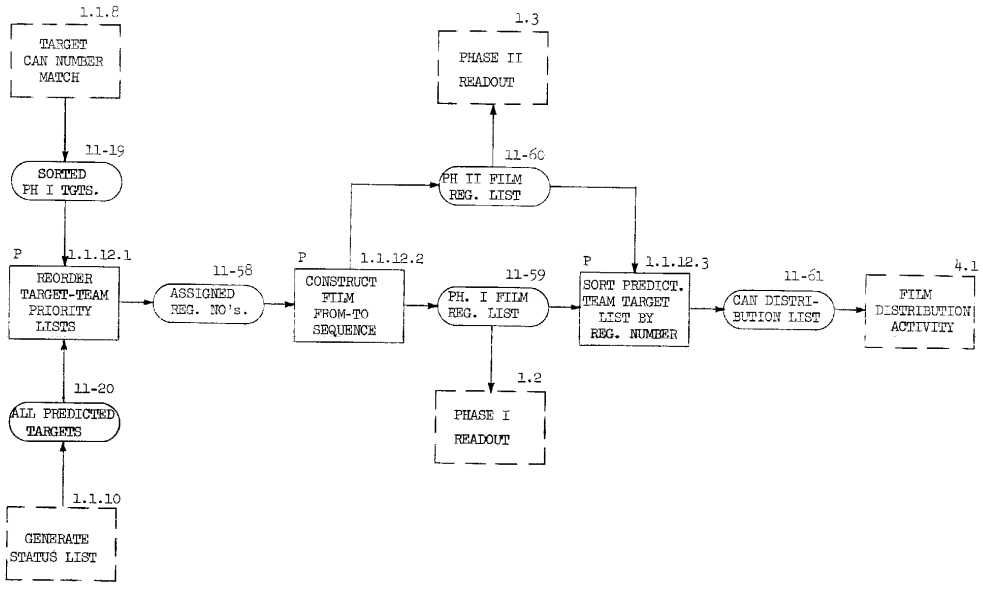

Figure 15 1.1.12 Film Can Assignment

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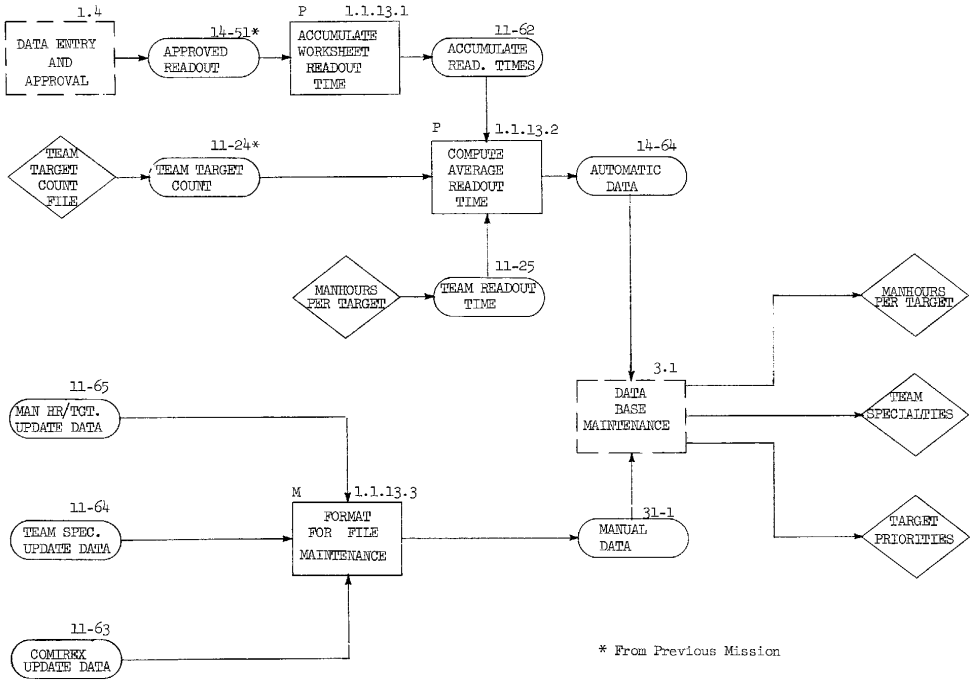

Figure 16 1.1.13 Prepare Update Data

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b. Assignment Procedures

Certain assignment procedures, because of timing considerations are accomplished with coverage prediction data only, while other procedures require specific film coordinate data. All assignment procedures are further complicated by the two-phase readout process. Single functions, with differences noted, have been charted for Phase I and Phase II processing to indicate this dual process. The input target lists are different and/or differently ordered, but each intervening process is the same, yielding two sets of similar results.

The coverage prediction data is used to:

1. Determine map requirements

2. Determine team workload (manhour) factor

3. Assign targets to PI teams

Both of the coverage prediction target lists are separately screened to determine what map references may be needed by the PI team during readout. The workload factor is determined by counting the targets assigned to each team and multiplying by the appropriate team readout time factor, (a file entry). Using this workload factor, sorted coverage, and the targets per team, a manual, tentative assignment of specific targets to PI's is made by each team Captain.

The film coordinate predicted data is used to:

1. Determine film can distribution

2. Print PI Presentation

3. Generate Status List

The two target lists are subdivided into team lists and include predicted film coordinate data, which serves as the input for film distribution and IDF presentation sheet preparation. Two film distribution lists are prepared; one ordered by target designator by team and the other by film can registry number. The PI presentation sheets are printed for use in Phase I

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3.1.1.2 Equipment Utilization

The only special peripheral equipment required to support the Pre-Readout Activity is a high speed printer since almost the entire output of this activity is printed lists for distribution to other activities. Table VII shows the processes of this activity which utilize the printer, the outputs which are generated, their size and frequency and an estimate of the average printer time per month required for each.

3.1.1.3 File Requirements

Table VIII shows the files and average daily access rates required for this activity.

3.1.2 Phase I Readout

3.1.2.1 Activity Description

First Phase readout is accomplished in PAG (with the assistance of PI's drawn from IAS and DIAAP) immediately upon the arrival of either satellite film or selected aircraft film which is to be initially interpreted by the Center. Support to the PI has already been provided through the printing of installation data presentations, film scheduling, and verification of the availability of maps described in Section 3.1.1.

During First Phase readout, (see Figures 17 through 19) the PI may utilize request/reply procedures through a console or by calling on an Information Specialist to obtain additional historical data (installation history, history of OB readouts, photo references). Through these procedures, he can also search indexes to source data material, and obtain information concerning objects; where they have been reported, measurements, descriptions, and other material. In addition, he has access to maps, PI keys, and film chip files in the PI room, and, through a CSD team member, access to installation folders containing pertinent collateral data, ground photography, and other references.

Approximately one-third of the new installation files which enter the data base (excluding tactical targets) are initiated as a result of First Phase readout. On a special new target form, the PI enters the identification of the target to the extent possible (through console examination of a file of headers for all targets) and a description of what he sees on the film. The data, if approved, is sent out in the Phase I report. The form is also sent to CSD for entry of other data which will, with the out-

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TABLE VII

EQUIPMENT UTILIZATION DURING PRE-READOUT ACTIVITIES

EQUIPMENT	PROCESS	INTERFACE	VOLUME	FREQUENCY	HOURS/MO.	REMARKS
High Speed Printer	1.1. 4.2	11-23	4000 lines/List	once/mission	0.16	
	1.1. 5.3	11-27	128 char./target	once/mission	0.11	3800 targets/mo.
	1.1. 5.3	11-28	20 char./target	once/mission	0.26	9400 targets/mo.
	1.1. 8.3	11-19	45,000 char./miss.	once/mission	0.11	
	1.1.10.7	11-20	400,000 char./miss.	once/mission	0.26	
	1.1.11.2	11-57	60 lines/target	1/pred. tgt.	6.33	3800 tgt./mo.
	1.1.11.2	11-57	30 lines/target	1/pred. tgt.	7.84	9400 tgt./mo.
	1.1.12.3	11-61	1800 characters	once/mission	0.33	
	1.1.12.2	11-59	1 line/target	once/mission	0.11	3800 tgt./mo.
	1.1.12.2	11-60	1 line/target	once/mission	0.26	9400 tgt./mo.

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TABLE VIII

FILE REQUIREMENTS FOR PRE-READOUT ACTIVITIES

FILE	PROCESS	AVERAGE ACCESSES/DAY
GEOIX	1.1. 2.1	1.0
WAIT LIST	1.1.10.2	600.0
	1.1.10.5	
TARGET PRIORITIES	1.1. 3.1	0.2
MANHOURS PER TEAM	1.1. 5.2	
	1.1.13.2	0.2
TEAM SPECIALITIES	1.1. 3.2	0.2
IDF	1.1. 2.1	
	1.1.11.1	600.0
	1.1. 4.1	0.2
TEAM TARGETS COUNT	1.1. 5.1	0.2

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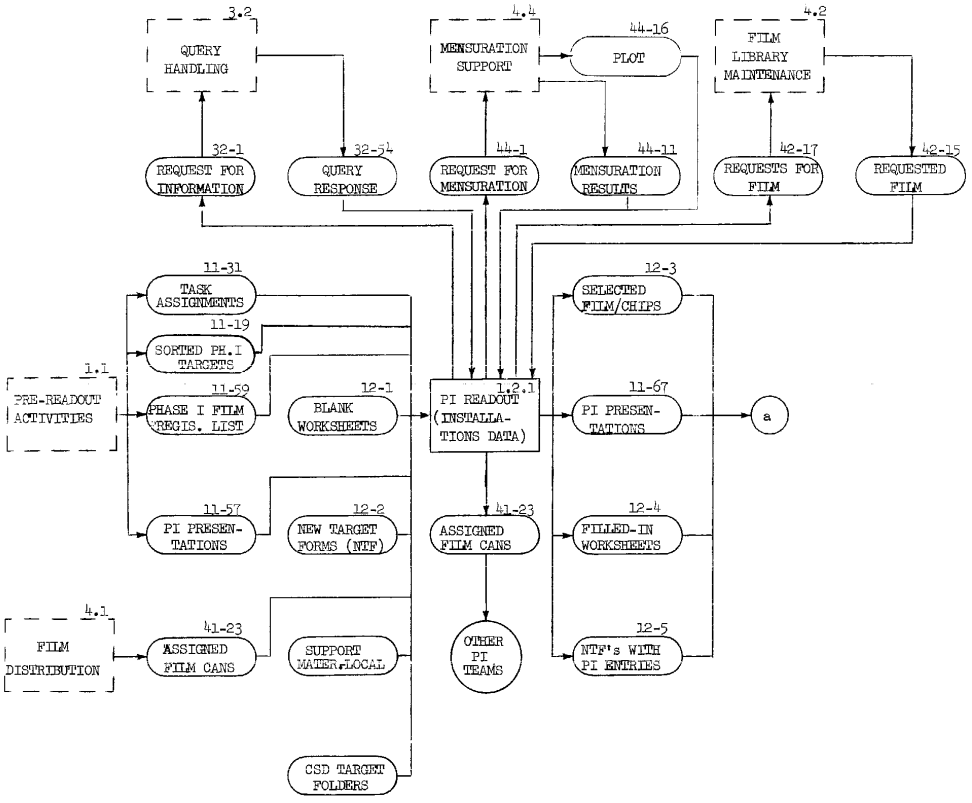

Figure 17 1.2 Phase I Readout

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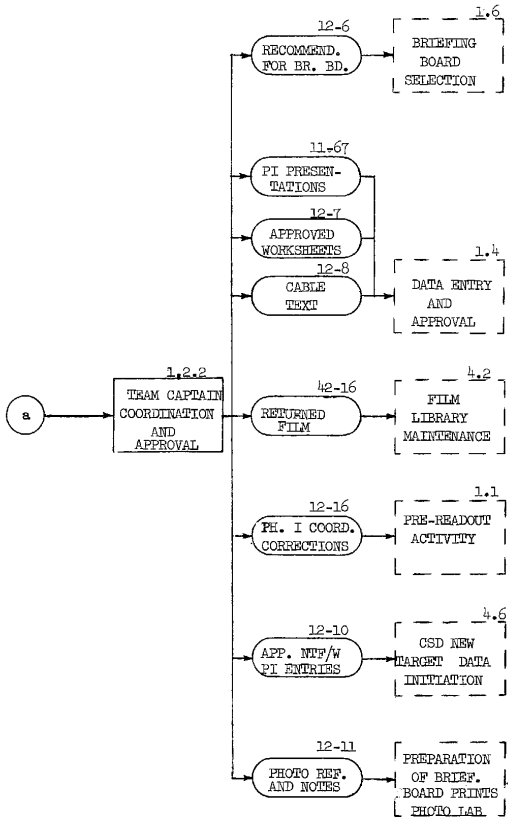

Figure 17 (cont'd) 1.2 Phase I Readout

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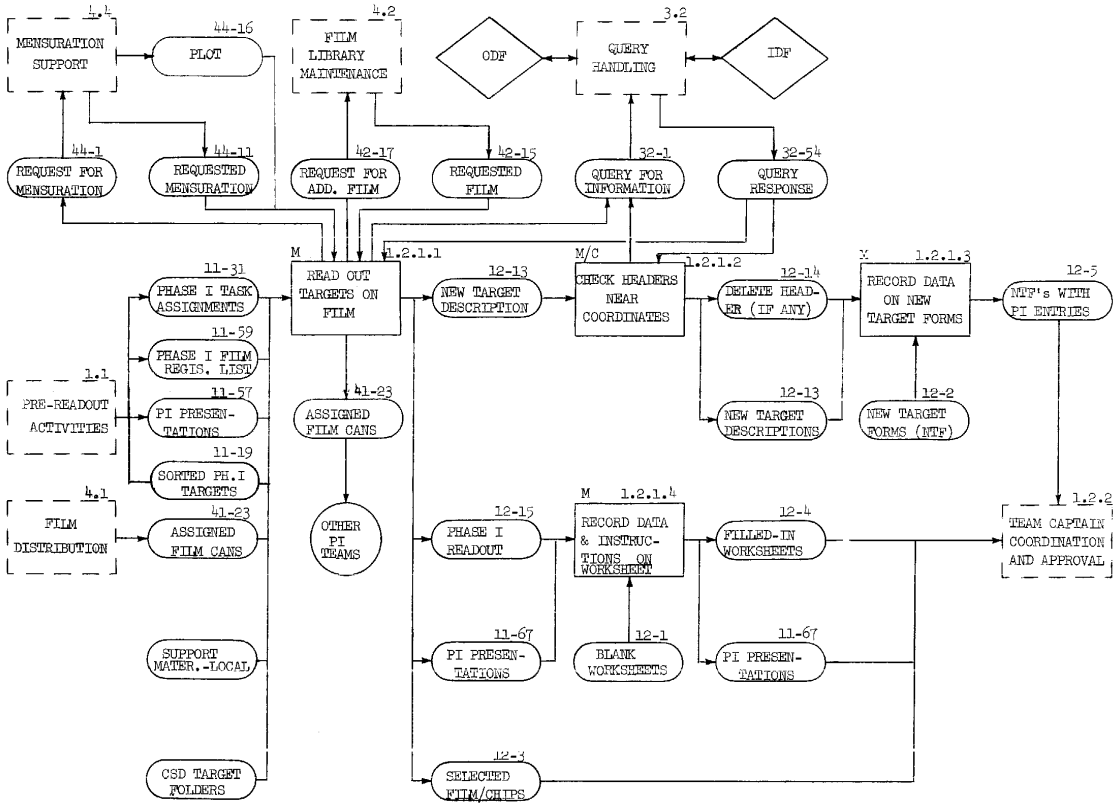

Figure 18 PI Readout (Installations Data)

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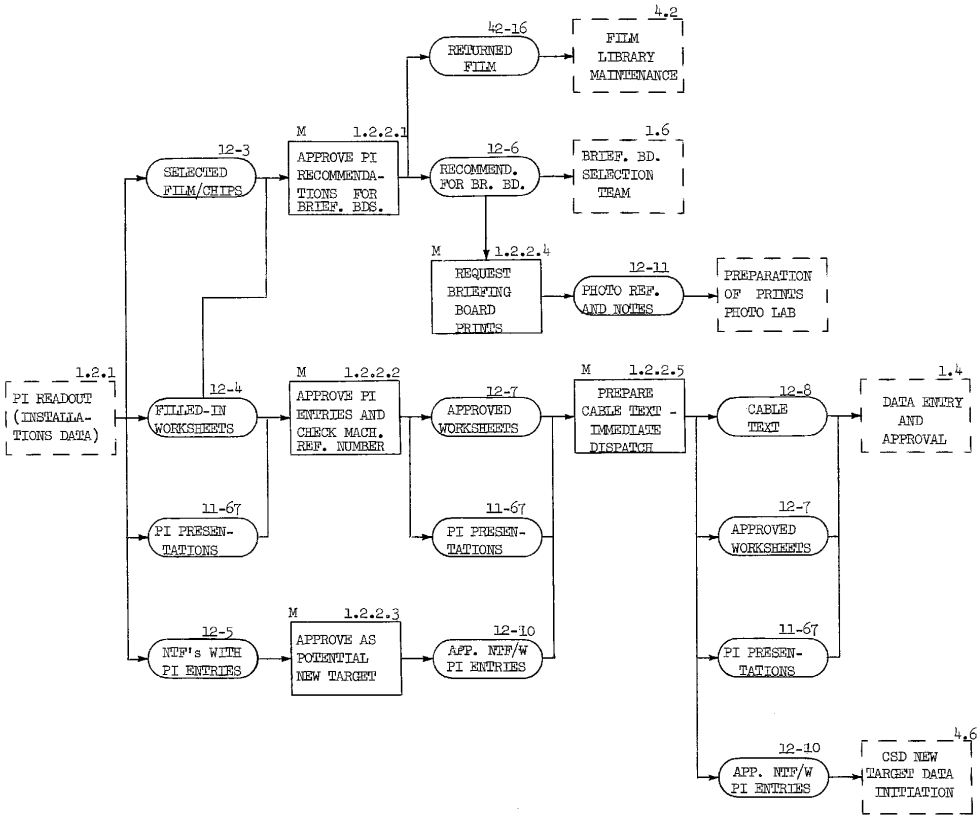

Figure 19 1.2.2 Team Captain Coordination and Approval

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he approves PI briefing board recommendations and takes action to provide photographic prints for briefing board consideration.

3.1.2.2 Equipment Utilization

During Phase I Readout, the photo interpreter will make requests for additional information from the data base to assist in his interpretation of the present target, request additional film from the library and examine the header record of the IDF to confirm new targets. These activities imply the use of a query/response device of some sort.

Since an automatic capability for data base query does not presently exist, there is no statistical data from which utilization times can be established. The information shown in Table IX is based therefore on several assumptions:

a. The average time required for one query/response cycle (i.e. the total time to obtain a satisfactory answer) is four minutes.

b. Information queries will be made on the average of once for every five targets.

c. Requests for additional film will average twice per 100 targets examined in Phase I.

d. Headers will be checked about fifteen times for every hundred targets.

e. About 3800 Phase I targets will be processed each month.

3.1.2.3 File Requirements

All file accesses for this activity have been included in the totals shown in Section 3.3.2.3 and hence are not duplicated here.

3.1.3 Phase II Readout

3.1.3.1 Activity Description

Phase II readout takes two forms in the Center. The satellite and selected aircraft film which is employed in Phase I readout is rescheduled for photo interpretation of lower priority targets immediately upon com-

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TABLE IX

EQUIPMENT UTILIZATION DURING PHASE I READOUT

EQUIPMENT	PROCESS	INTERFACE	FREQUENCY	HOURS/MO.	REMARKS
Query/Response Device	1.2.1.1	42-17	2/100 targets	3.0	2 min. ea.
		32-1 32-54	1/5 targets	50.0	4 min. ea.
	1.2.1.2	32-1 32-54	15/100 targets	38.0	4 min. ea.
Keyboard Entry	1.2.2.4	12-11	30/mission	2.0	1 min. ea.

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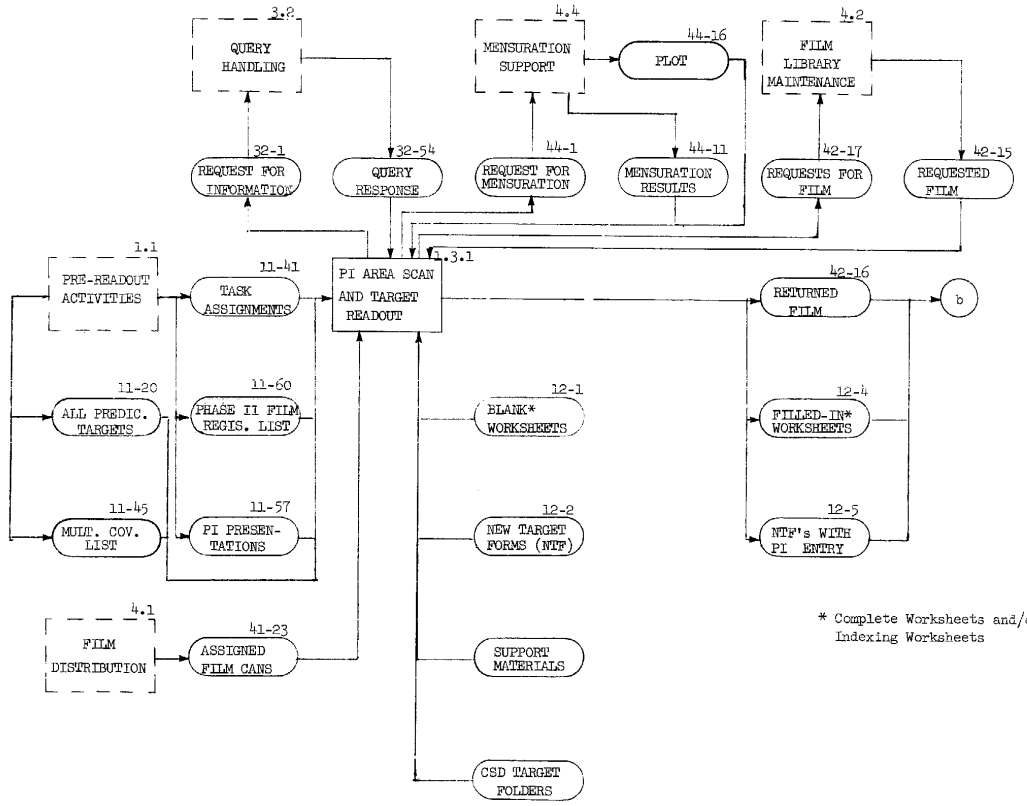

Figure 20 1.3 Phase II Readout

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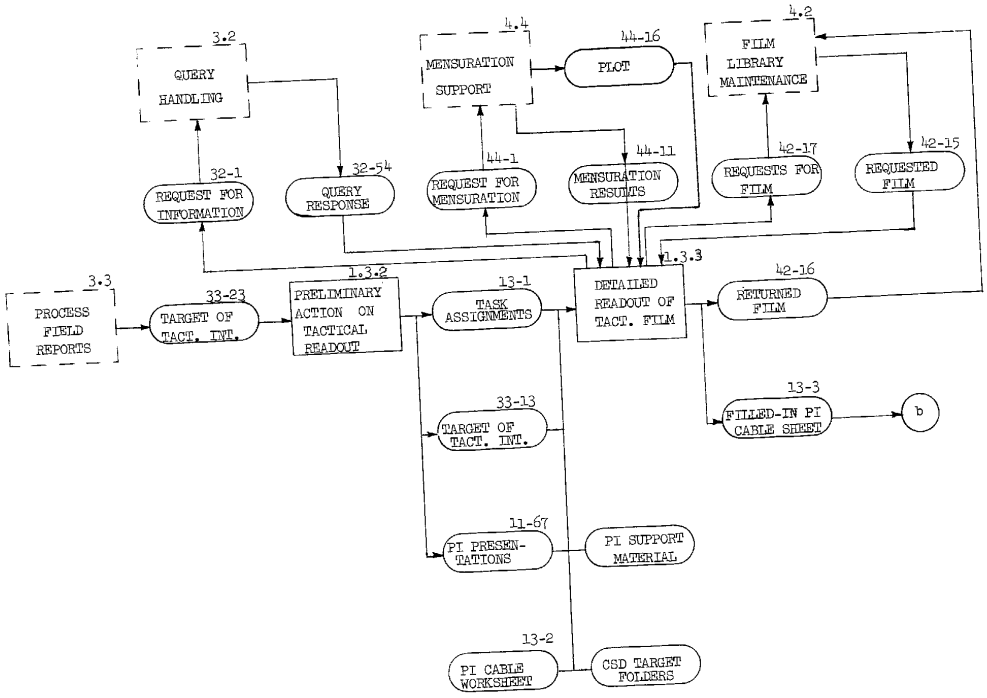

Figure 20 (cont'd) 1.3 Phase II Readout

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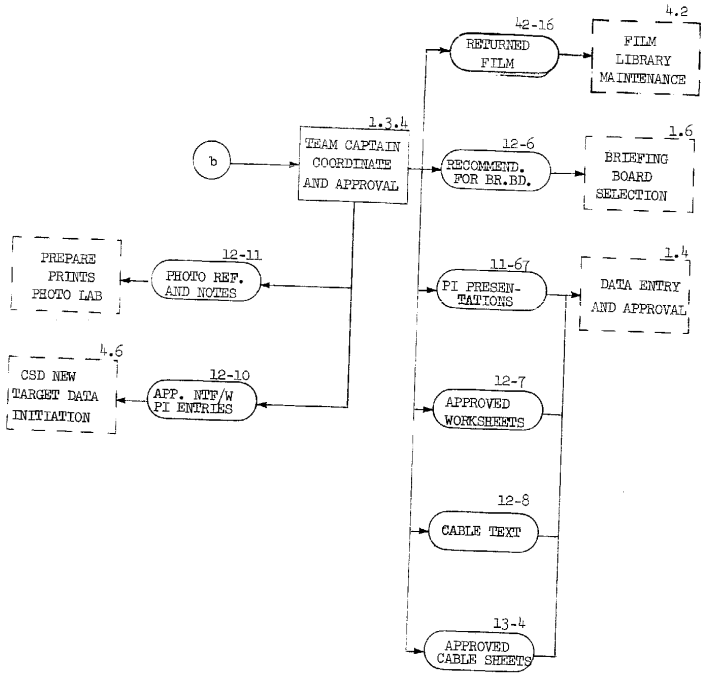

Figure 20 (cont'd) 1.3 Phase II Readout

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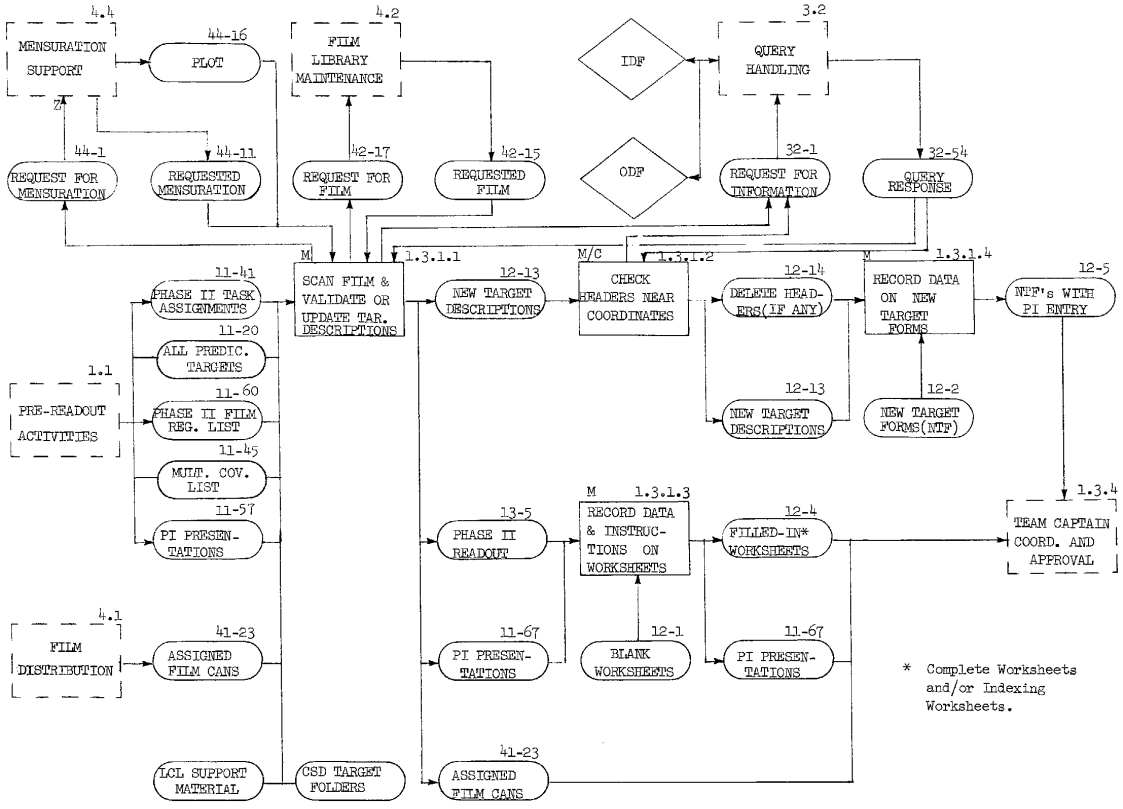

Figure 21 1.3.1 PI Area Scan and Target Readout

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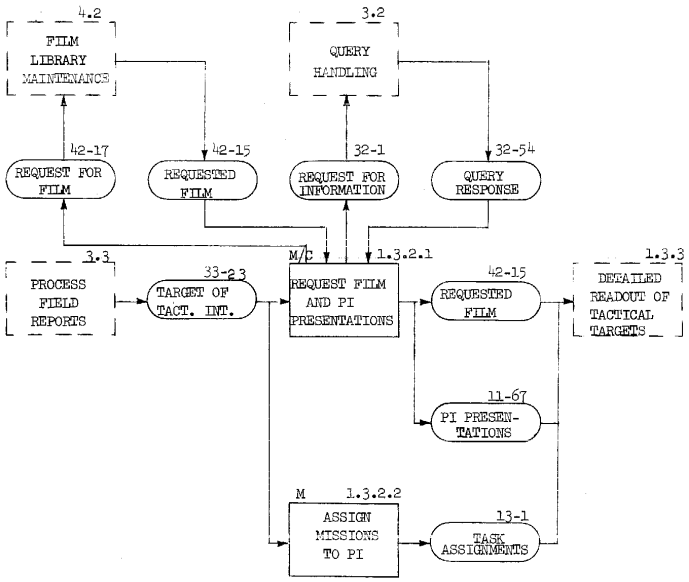

Figure 22 1.3.2 Preliminary Action in Tactical Film Readout

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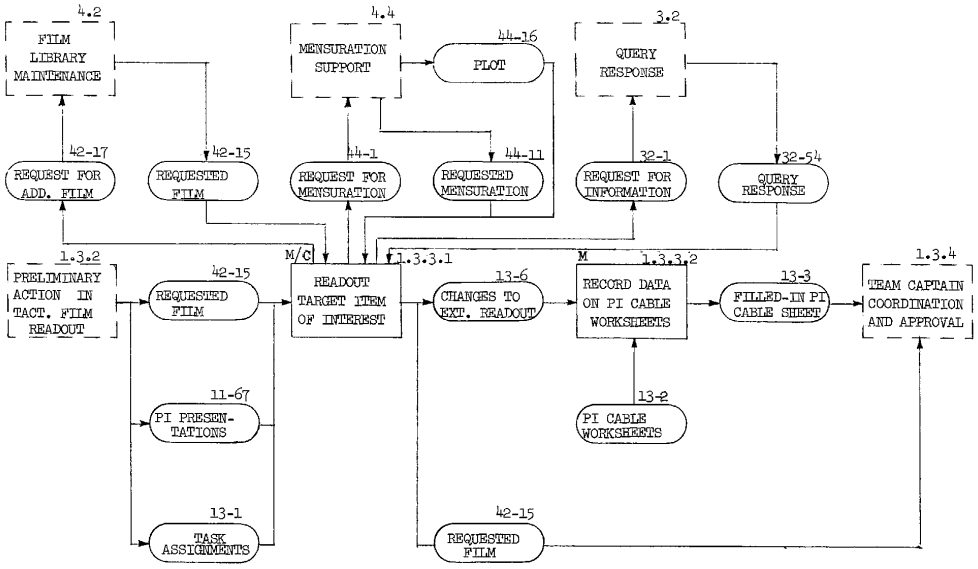

Figure 23 1.3.3 Detailed Readout of Tactical Targets

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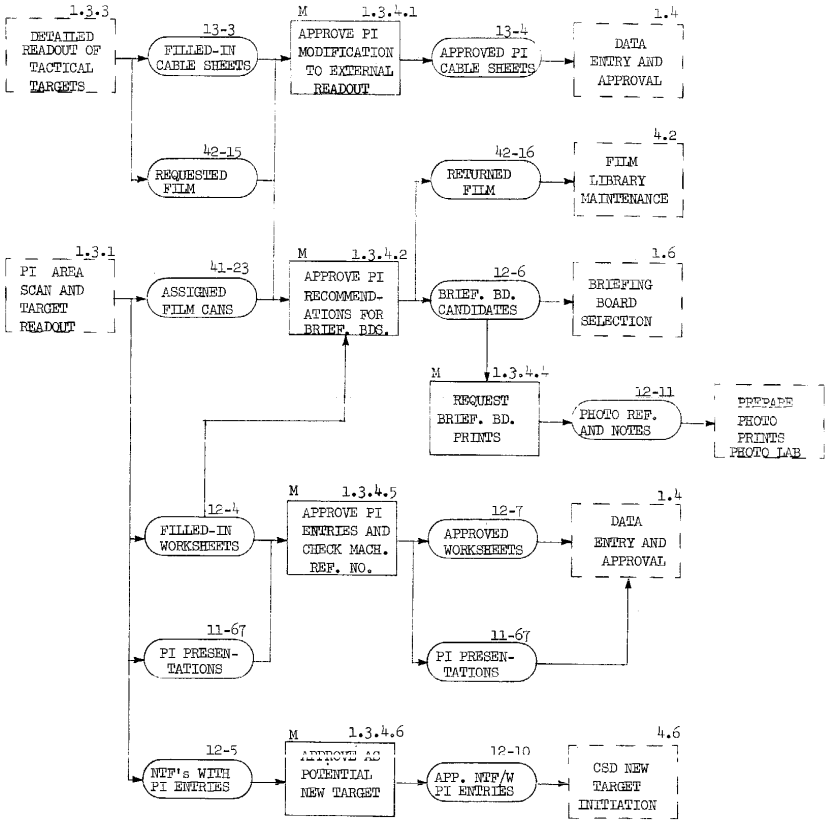

Figure 24 1.3.4 Team Captain Coordination and Approval

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In the Phase II readout, the PI is automatically provided with the same support from Pre-Readout Activities (Section 3.1.1) which he received on First Phase readout (Section 3.1.2), and has access to other forms of support on an equal basis. In this activity, if the target shows no change, he is responsible to provide only a photo reference and, where photography permits, a new date on the description in the file. Only changes and new targets are reported out to the community as a result of this form of Phase II readout. Approximately one-sixth of the new targets entered into the data base are acquired in this form of readout as a result of film scan.

The second type of Phase II readout is accomplished on a selective basis. Cable reports of external First Phase readout are scanned to determine targets of interest (see Section 3.3.3). The information provided by this activity identifies the mission film, and targets to be read out. When film arrives, the PI presentations and appropriate film are requested.

The PI records, on a special form, any differences in interpretation from that reported in the external First Phase report, e.g. detailed identification, additions, or changes. This data is recorded in the NDBIDI and sent to external users via the computer-to-computer link and cable after final approval. (See Section 3.1.4).

3.1.3.2 Equipment Utilization

The Phase II Readout activity differs very little from the Phase I activity insofar as the use which will be made of the IIS is concerned. Table X reflects the differences in equipment utilization engendered by the differences in numbers of targets scanned. The assumptions of Section 3.1.2.2 have been used in estimating time.

3.1.3.3 File Requirements

All file accesses for this activity have been included in the totals shown in Section 3.3.2.3 and hence are not duplicated here.

3.1.4 Data Entry and Approval - Immediate Reports

3.1.4.1 Activity Description

This activity includes the functions necessary to transform the PI written entries on four different types of input forms into machine readable form and then to assure the correctness of the data before it is used in reports or is stored in the IIS file.

The functions of verification, editing, and approval each utilize a console display of the data. The display for verification of each target readout is initiated by the Verifier upon the receipt of the appropriate

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TABLE X

EQUIPMENT UTILIZATION DURING PHASE II READOUT

EQUIPMENT	PROCESS	INTERFACE	FREQUENCY	HOURS/MO.	REMARKS
Query/Response	1.3.1.1	42-17	2/100 targets	6.0	9400 targets
		32-1 32-54	3800/month	125.0	2 min. ea.
	1.3.1.2	32-1 32-54	30/100 targets	188.0	
	1.3.2.1	42-17	See NOTE 1	NOTE 1	NOTE 1: These values are already included in the estimates for 1.3.1.1 and 1.3.1.2
		32-1	" " "	" "	
		32-54	" " "	" "	
	1.3.3.1	42-17	" " "	" "	
		32-1	" " "	" "	
		32-54	" " "	" "	
Keyboard	1.3.4.4	12-11	See NOTE 2	NOTE 2	NOTE 2: 30 Briefing Boards/ Mission is average total for Phase I and Phase II. This usage has already been estimated in 3.1.2.2

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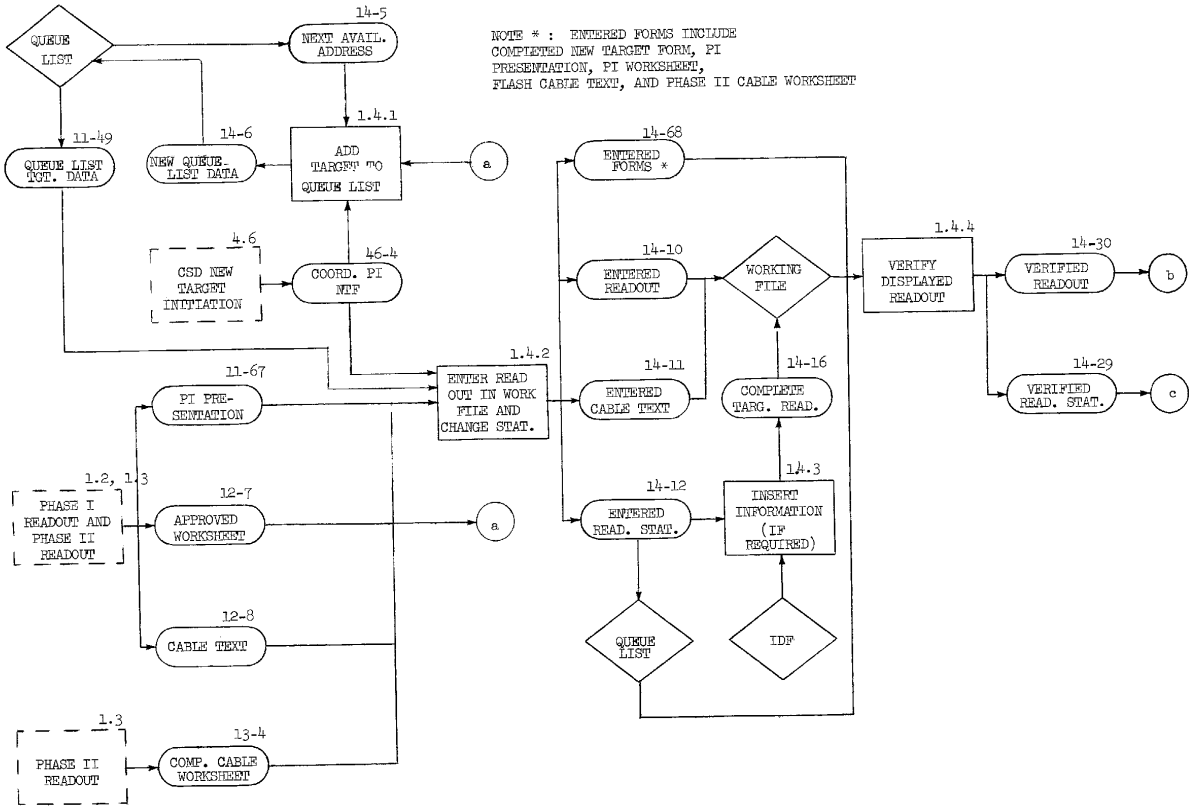

Figure 25 1.4 Data Entry and Approval - Immediate Reports Sheet 1 of 2

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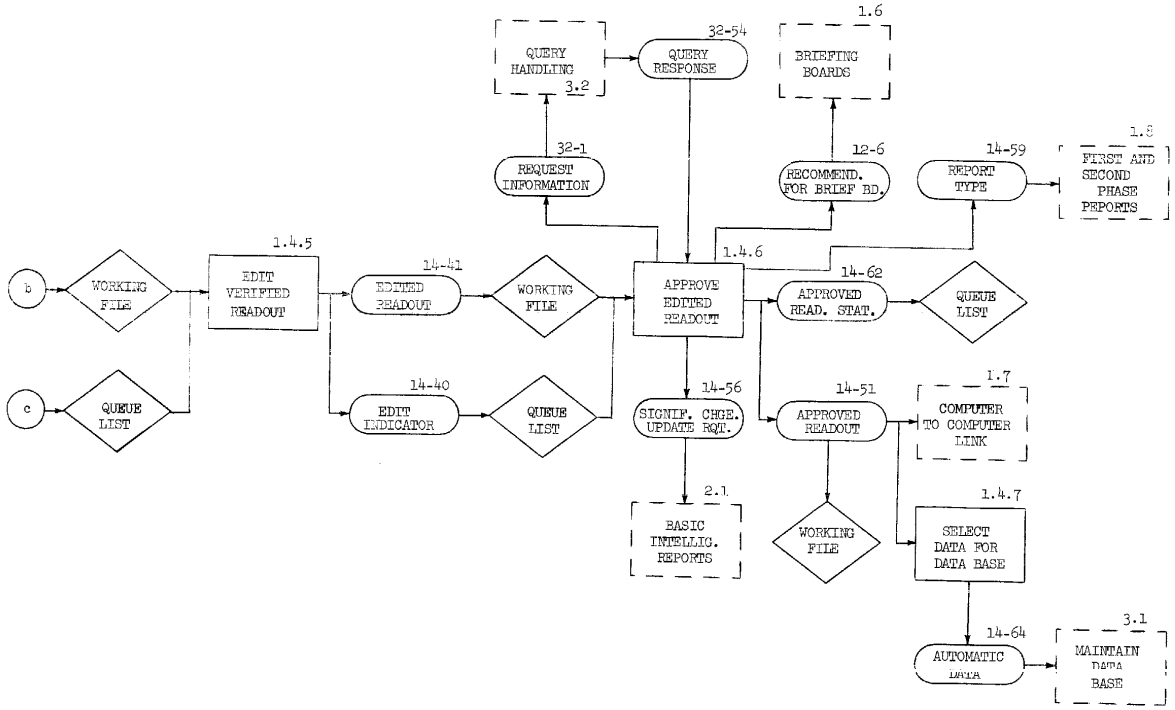

Figure 25 (cont'd) 1.4 Data Entry and Approval - Immediate Reports

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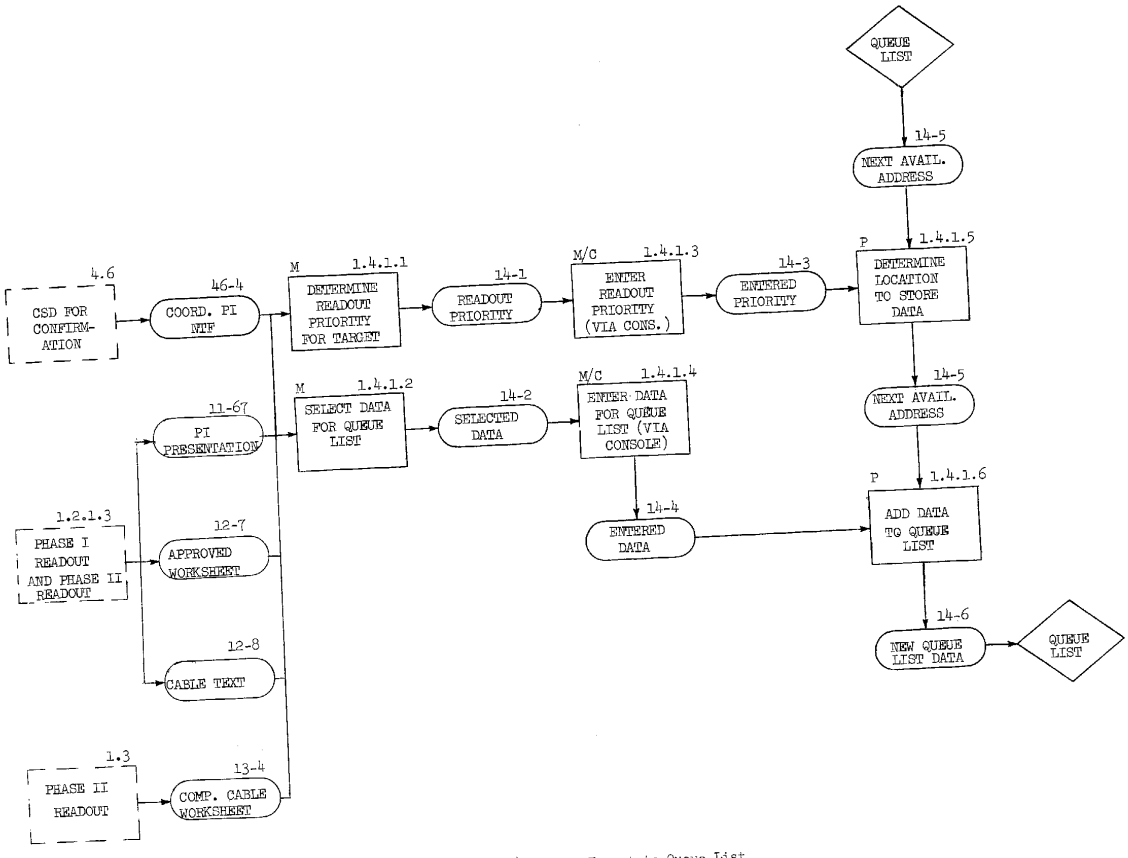

Figure 26 1.4.1 Add Target to Queue List

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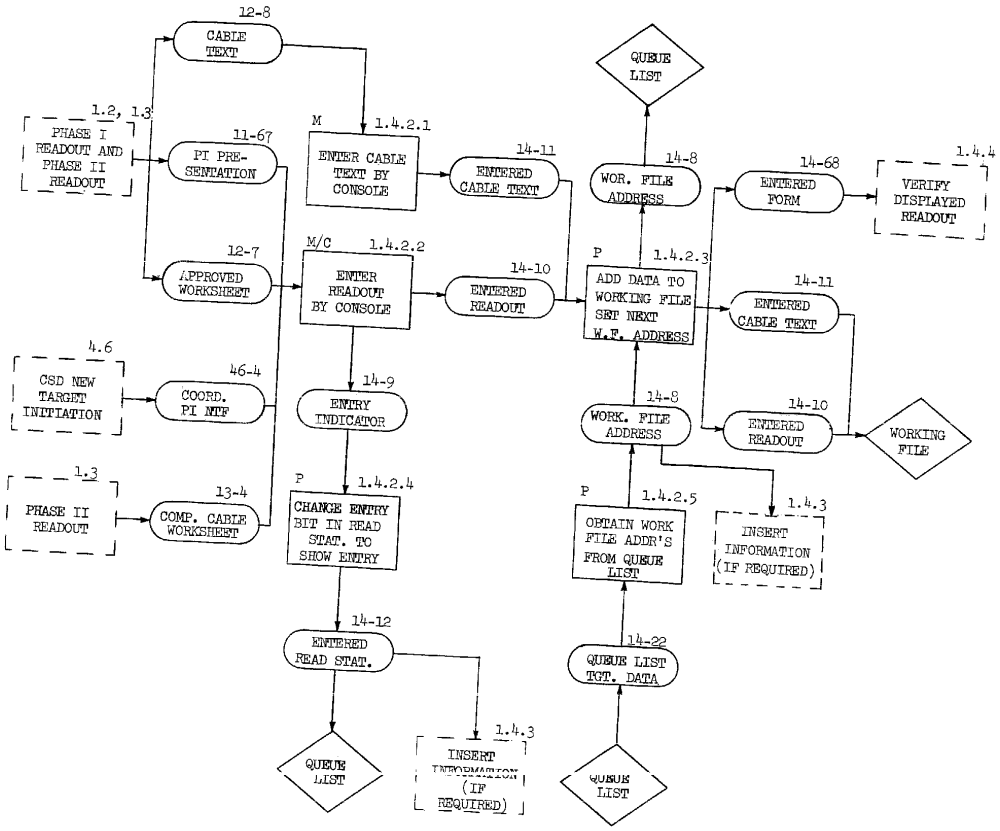

Figure 27 1.4.2 Enter Readout in Working File and Change Status

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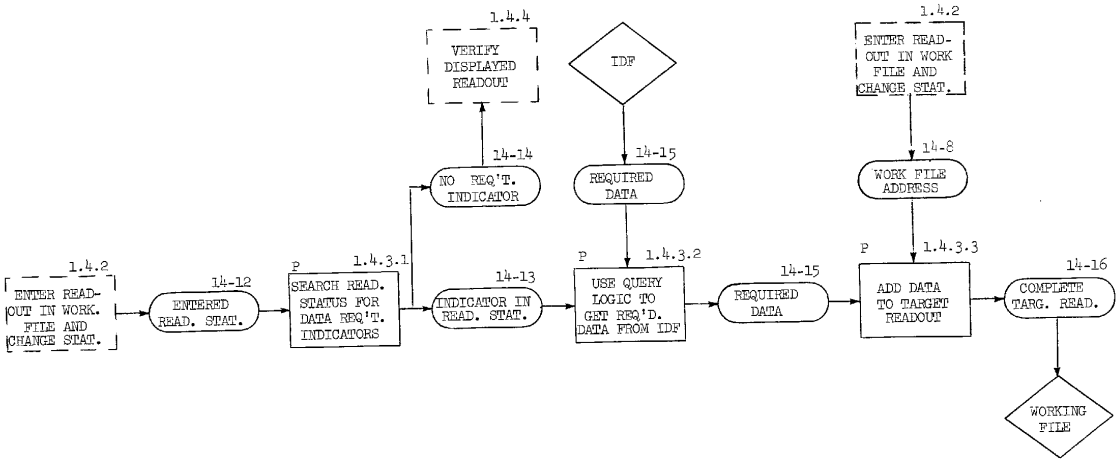

Figure 28 1.4.3 Insert Information (If Required)

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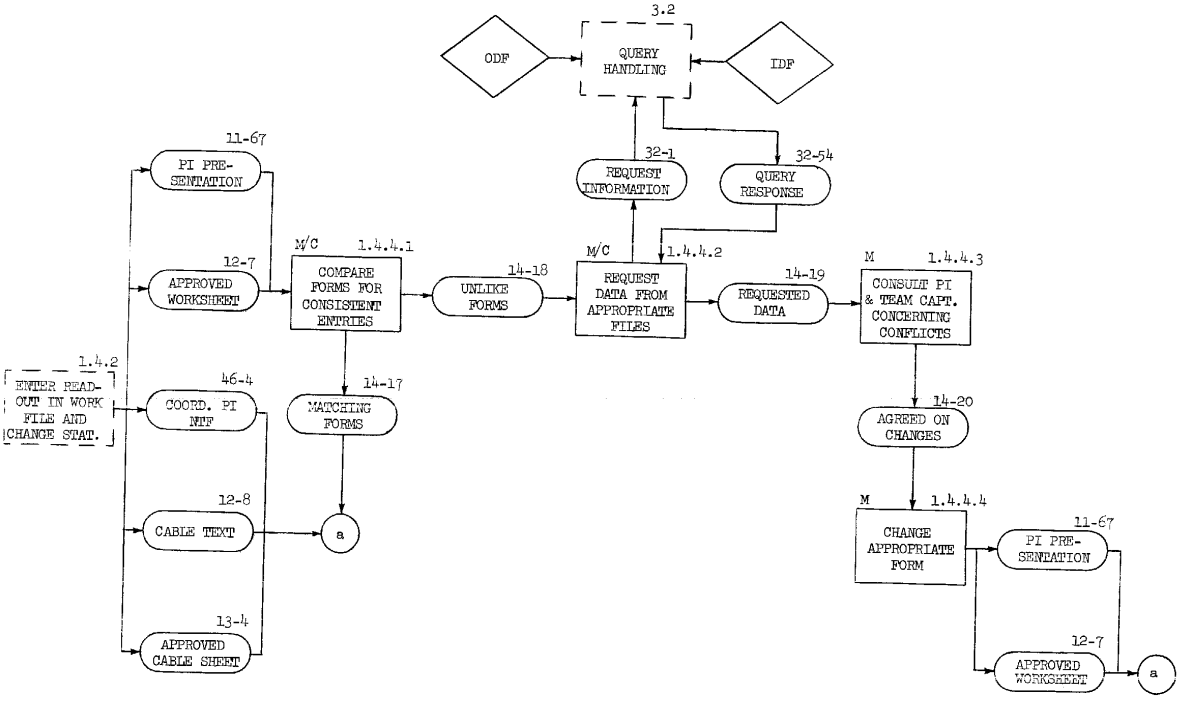

Figure 29 1.4.4 Verify Displayed Readout

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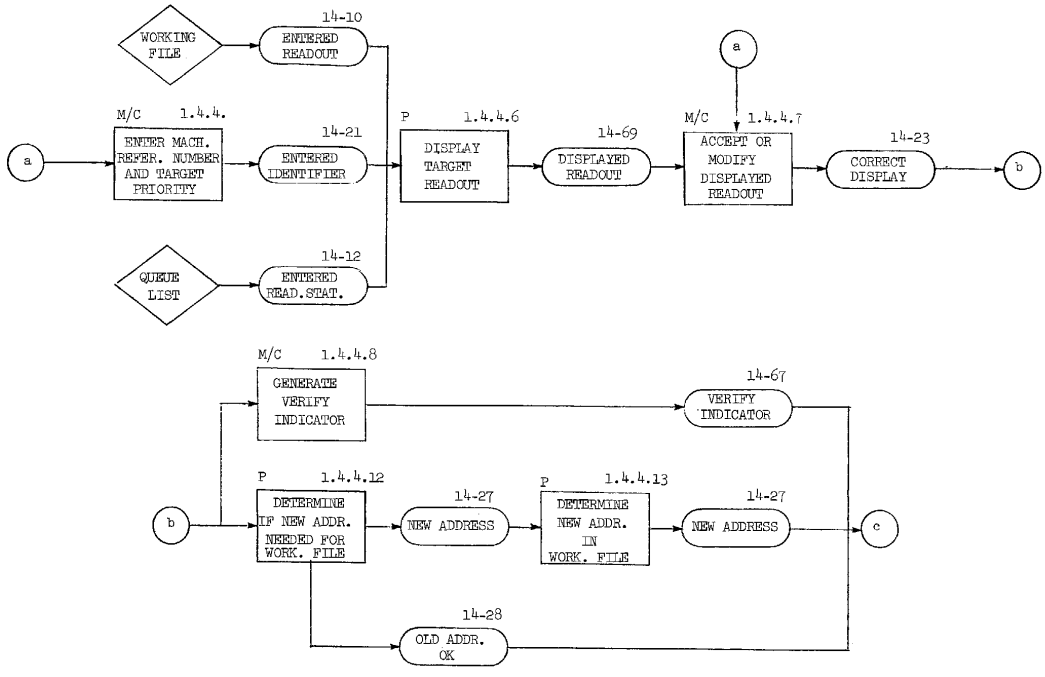

Figure 29 (cont'd) 1.4.4 Verify Displayed Readout

Sheet 2 of 3

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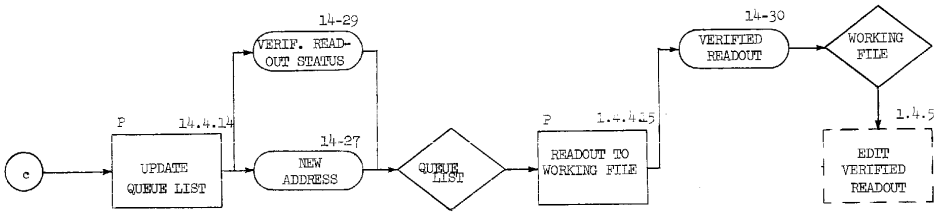

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Figure 29 (cont'd) 1.4.4 Verify Displayed Readout

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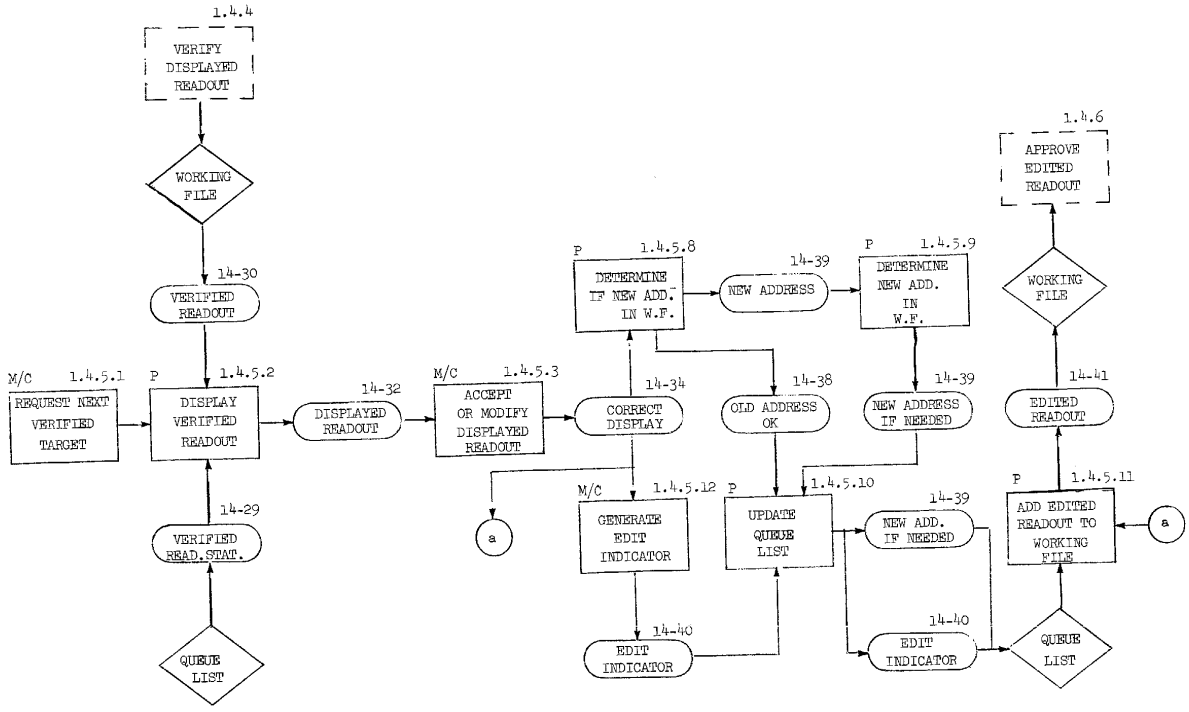

Figure 30 1.4.5 Edit Verified Readout

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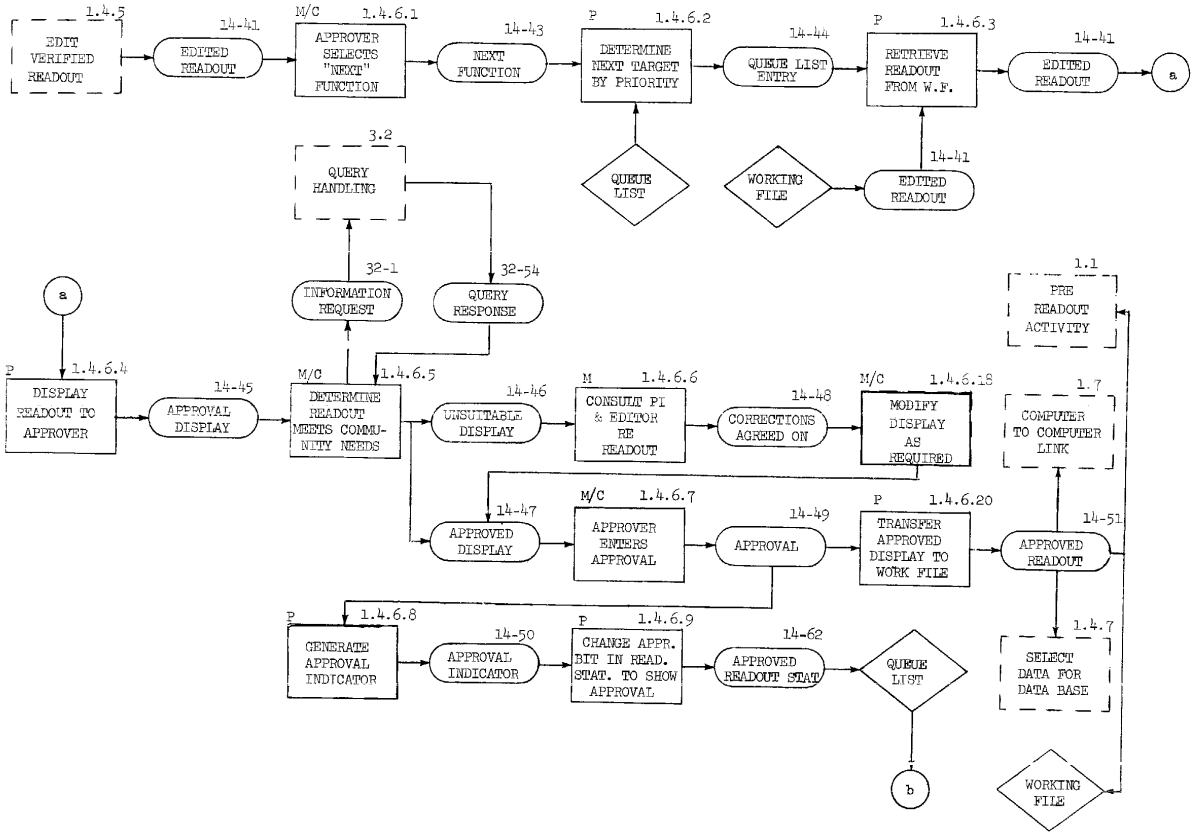

Figure 31 1.4.6 Approve Edited Readout

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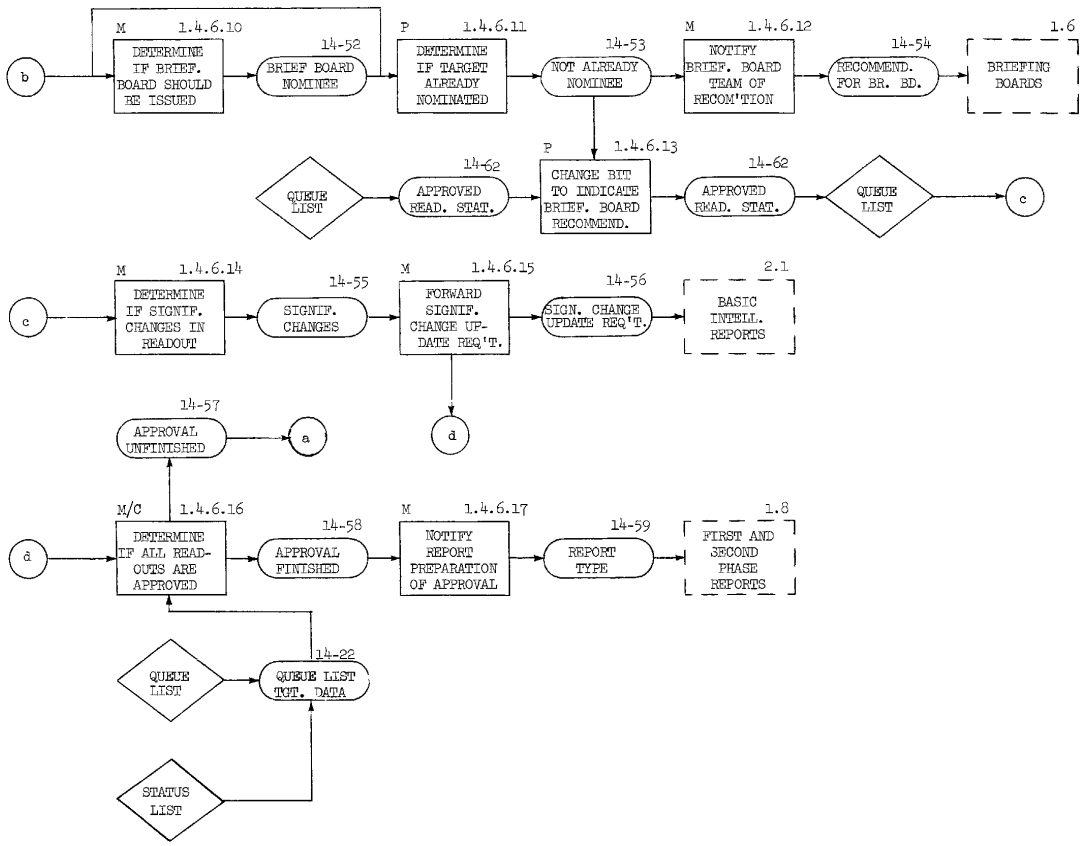

Figure 31 (cont'd) 1.4.6 Approve Edited Readout

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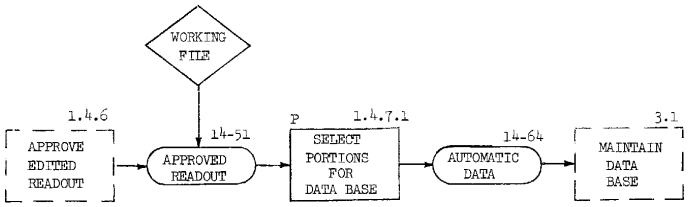

Figure 30 1.4.7 Select Data for Data Base

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written form (i.e. Worksheet, Cable Worksheet or new target form). Editing and approval displays of a single readout will be initiated by the setting of a console function key which requests the next readout. This difference in procedure is based on the assumption that a verifier will be particularly acquainted with a given set of targets and hence will require the ability to be selective in his displays. Furthermore, he will want to confirm that the original copy from the PI has been correctly entered into the computer. An editor, on the other hand, can perform his duties equally well on any target. Approval authority is vested in a single individual who will examine the reports for all targets. A computer selected display based on target priority is therefore more appropriate. This activity is diagrammed in Figures 25 through 32.

3.1.4.2 Equipment Utilization

The peripheral equipment required during the Data Entry and Approval Activity for Immediate Reports will include the devices necessary to convert the contents of the PI Worksheets, cable forms and New Target Forms to computer records, and the Input/Output consoles with correction capability necessary for the verification, editing and approval functions.

In estimating the equipment utilization for this activity shown in Table XI, the following assumptions have been made:

a. An entry cycle must be followed by a retrieval and display to permit visual verification that the data was entered correctly.

b. Data entry time is approximately 4 minutes per target.

c. Verification requires about 10 minutes per target.

d. Editing requires about 4 minutes per target.

e. Approval requires about 2 minutes per target.

3.1.4.3 File Requirements

Table XII shows the files and average daily access rates required for this activity.

3.1.5 Cables

3.1.5.1 Activity Description

This is a very simple activity, consisting of only two functions, as shown in Figures 33 through 35. It should be noted however that it is

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TABLE XI

EQUIPMENT UTILIZATION FOR DATA ENTRY AND APPROVAL - IMMEDIATE REPORTS

EQUIPMENT	PROCESS	INTERFACE	FREQUENCY	HOURS/MO.	REMARKS
Data Entry Device	1.4.1.3	14-3	1/new target	378.0	3800 targets/month
	1.4.1.4	14-4	1/new target		4 min./Phase I target
	1.4.2.1	14-11	50/mission		0.8 min./Phase II target
	1.4.2.2	14-10	1/target		
Input/Output Console with Correction Capability	1.4.4.2	32-1 32-54	once/target		
	1.4.4.5	14-21		945.0	
	1.4.4.6	14-69	33% require correction		Verification
	1.4.4.7	14-22			10 min./target
	1.4.4.11	14-23			
	1.4.4.8	14-24			
	1.4.5.1	14-20		378.0	
	1.4.5.3	14-33	once/target		Editing
	1.4.5.7	14-34	20% require correction		4 min./target
	1.4.5.4	14-35			
	1.4.6.1	14-43	once/target	189.0	Approval
	1.4.6.4	14-45	5% not approved and re-cycled		2 min./target
		14-49			
	1.4.6.17	14-59			

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TABLE XII

FILE REQUIREMENTS FOR DATA ENTRY AND APPROVAL - IMMEDIATE REPORTS

FILE	PROCESS	AVERAGE ACCESSES/DAY
QUEUE LIST	1.4.1.5	16.0
	1.4.1.6	
	1.4.2.3	
	1.4.2.4	
	1.4.2.5	1250.0
	1.4.4.6	
	1.4.4.14	
	1.4.4.15	1300.0
	1.4.6.2	
	1.4.6.9	
	1.4.6.10	
	1.4.6.13	
	1.4.6.16	
	1.4.6.18	
	1.4.6.19	690.0
WORKING FILE	1.4.4.6	
	1.4.4.15	750.0
	1.4.5.2	

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TABLE XII (Con't)

FILE REQUIREMENTS FOR DATA ENTRY AND APPROVAL - IMMEDIATE REPORTS

FILE	PROCESS	AVERAGE ACCESSES/DAY
WORKING FILE (Cont'd.)	1.4.7.1	600.
	1.4.2.3	600.
	1.4.3.3	600.
IDF	1.4.3.2	600.
	1.4.4.2	30.
ODF	1.4.4.2	30.

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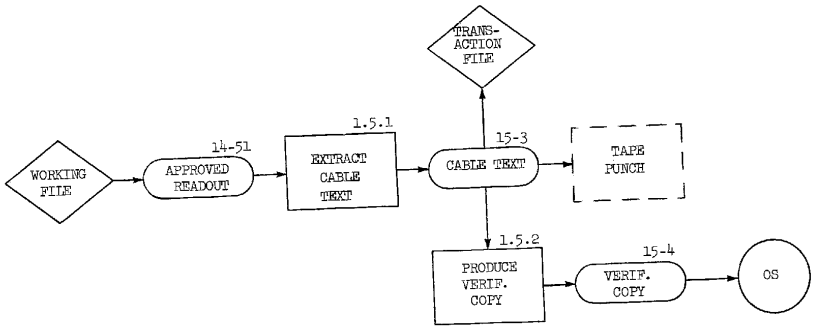

Figure 33 1.5 Cable Text

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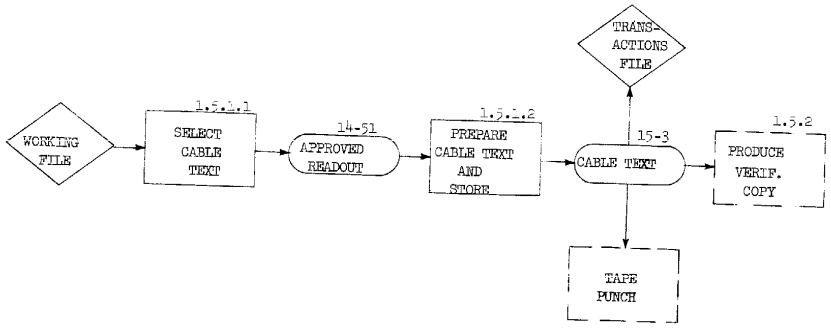

Figure 34 1.5.1 Extract Cable Text

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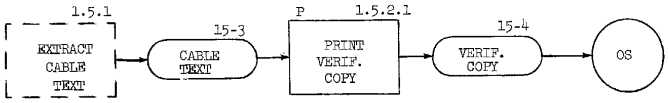

Figure 35 1.5.2 Produce Verification Copy

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intended only to produce cables about single targets (See Section 3.1.4) where information of urgent importance has been interpreted. The cable versions of complete Phase I and Phase II reports are processed as shown in Section 3.1.8.

In this activity the approved cable text for one report is extracted from the Working File. A verification copy is sent to OS where transmission can be initiated. The message is also placed in a Transactions File for permanent record.

3.1.5.2 Equipment Utilization

The only peripheral equipment required for this activity is a teleprinter to produce the Verification Copy of the cable (Interface Ref. No. 15-4). With an average of 100 cables of this type per month, utilization will be about 5.5 hours.

3.1.5.3 File Requirements

Table XIII shows the files and average daily access rates required for this activity.

3.1.6 Briefing Board Generation

3.1.6.1 Activity Description

Automated support for Briefing Board generation is depicted in Figures 36 through 38 for first and second phase readout. Third phase processes will essentially be as depicted without the mission readout inputs from the data entry process and without the candidate processing functions described. The reason for this is that during the time frame of third phase readout, mission readout data is not being entered into the system and large numbers of candidates are not being considered for selection.

The process described provides a list of candidates and approved target readout data to the Briefing Board coordinators, which they can use to select the Briefing Boards to be produced, assign personnel and schedule production. The other automated functions are 1) the printout of the approved mission readout for the Briefing Board notes and 2) Query/Reply routines to the IIS data base. The Query/Reply routines provide rapid access to the files for such items as: collateral data, background material, target location, previous photo mission coverage, latest Briefing Board reference, etc.

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TABLE XIII

FILE REQUIREMENTS FOR CABLE TEXT PREPARATION

FILE	PROCESS	AVERAGE ACCESSES/DAY
WORKING FILE	1.5.1.1	7.0
TRANSACTIONS FILE	1.5.1.4	7.0

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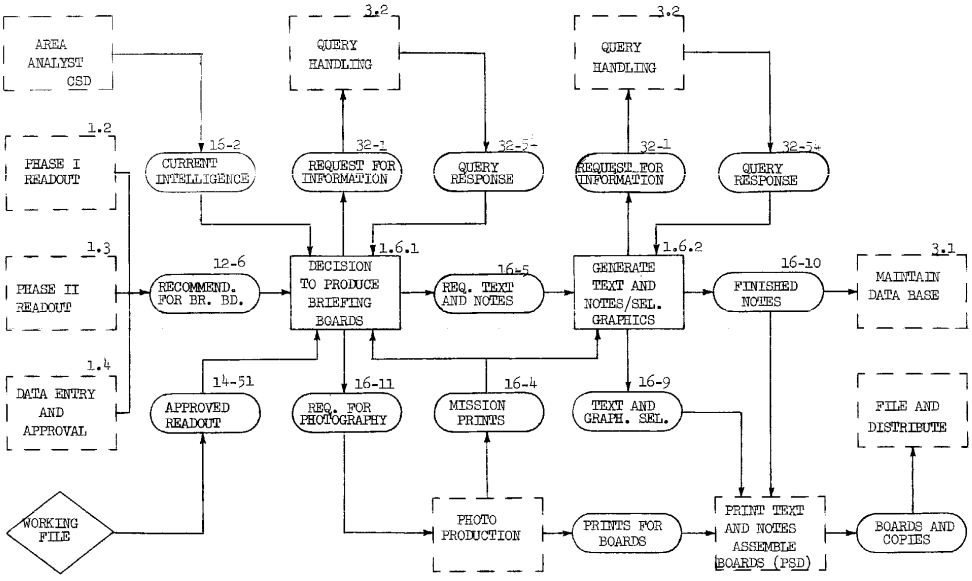

Figure 36 1.6 Briefing Board Generation

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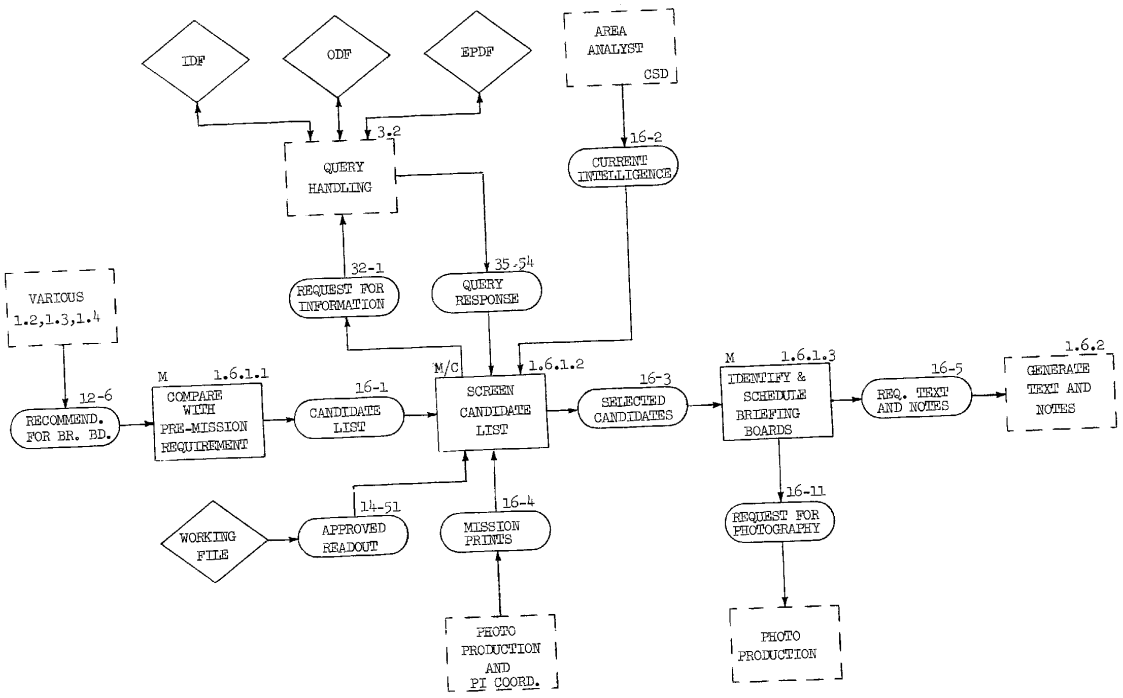

Figure 37 1.6.1 Decision to Produce Briefing Boards

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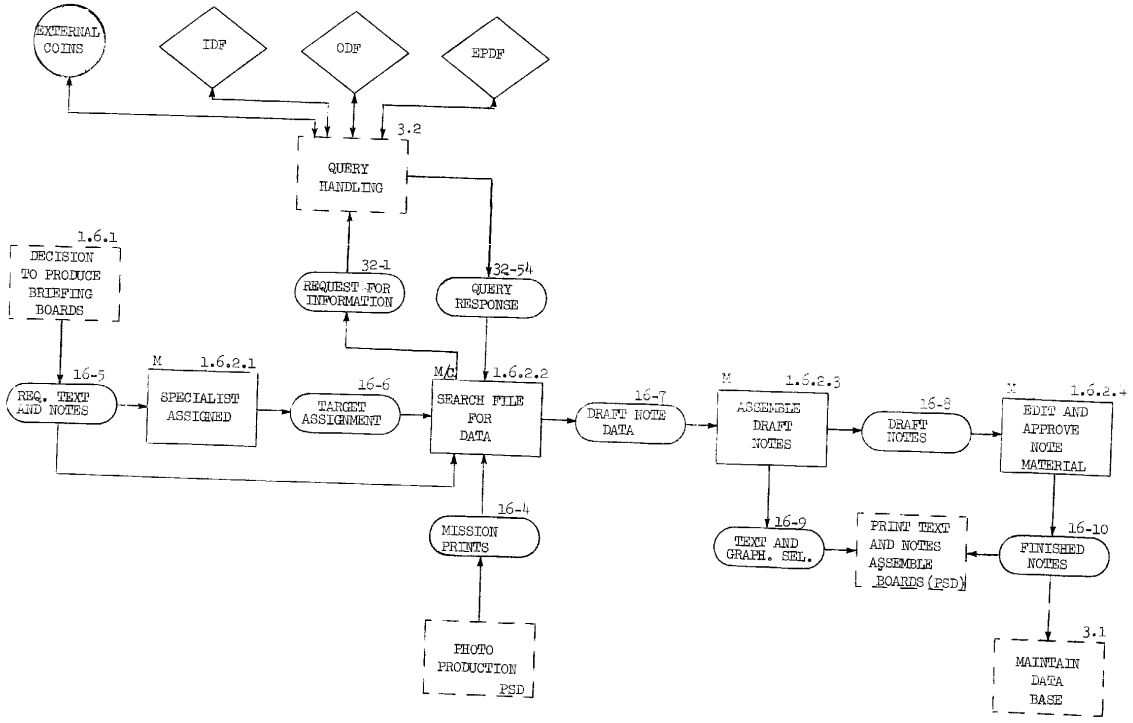

Figure 38 1.6.2 Generate Text and Notes/Select Graphics

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3.1.6.2 Equipment Utilization

The preparation of Briefing Boards is essentially a manual procedure but makes moderate use of a Query/Response device and a simple printer to produce hard copy of data received from the files. Since, in order to be most useful, this printer should be in CSD where total utilization is quite low, a simple printer (25 characters/sec.) appears to be satisfactory. Table XIV is a summary of the equipment requirements for this activity.

3.1.6.3 File Requirements

Table XV shows the files and average daily access rates required for this activity.

3.1.7 Computer-to-Computer Link

3.1.7.1 Activity Description

The computer-to-computer link is used by community members to update machine files as soon as possible after a mission readout. A standard format, agreed upon by the community, will be used for these transmissions.

The individual target readouts will be sent out as soon as possible after they have been approved. A signal to the Executive Program after approval has been accomplished initiates the operation of the programs which generate the messages. The frequency of the transmission will be determined by the level of activity of the total computer system.

The activities involved in generating the data to be transmitted over the computer-to-computer link are shown in Figures 39 through 42.

3.1.7.2 Equipment Utilization

As implied by the title of this activity, no equipment other than the central computer complex is required.

3.1.7.3 File Requirements

Table XVI shows the files and average daily access rates required for this activity.

3.1.8 First and Second Phase Report Production

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TABLE XIV

EQUIPMENT UTILIZATION FOR BRIEFING BOARD PREPARATION

EQUIPMENT	PROCESS	INTERFACE	FREQUENCY	HOURS/MO.	REMARKS
Query/Response Device	1.6.1.2	16-3	30/mission	2.0	2 min./each query
	1.6.2.2	16-7	25/mission	3.3	2 min./each query
Printer	1.6.1.2	16-3	25/mission	0.8	25 characters/second
	1.6.2.2	16-7	25/mission	3.2	

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TABLE XV

FILE REQUIREMENTS FOR BRIEFING BOARD PREPARATION

FILE	PROCESS	AVERAGE ACCESSES/DAY
IDF	1.6.1.2	10.
	1.6.2.2	50.
	1.6.2.4	5.
ODF	1.6.1.2	2.
	1.6.2.2	10.
	1.6.2.4	1.
EPDF	1.6.1.2	8.
	1.6.2.2	60.
	1.6.2.4	6.

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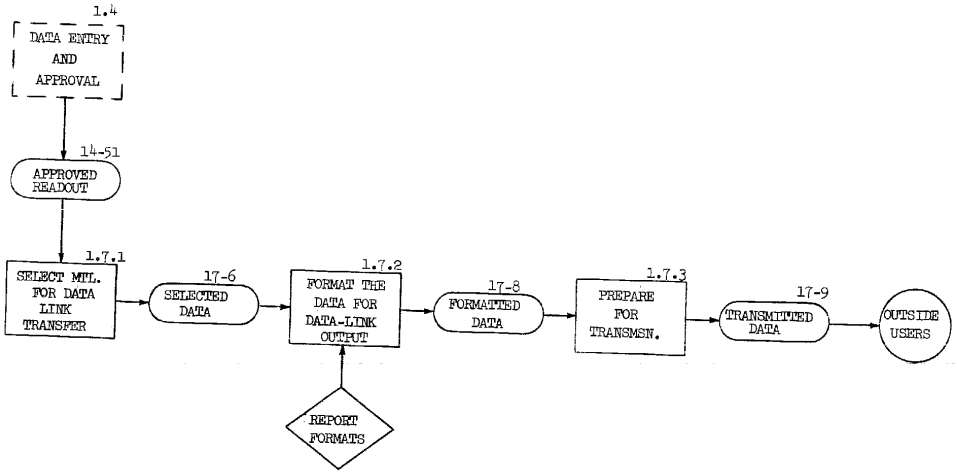

Figure 39 1.7 Computer-to-Computer Link Operation

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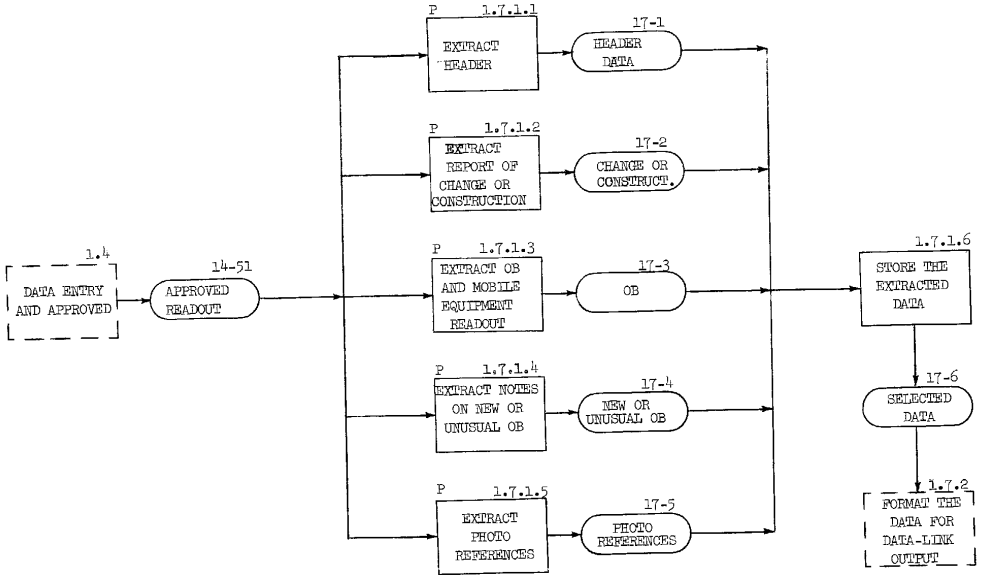

Figure 40 1.7.1 Select Material for Data Link Transfer

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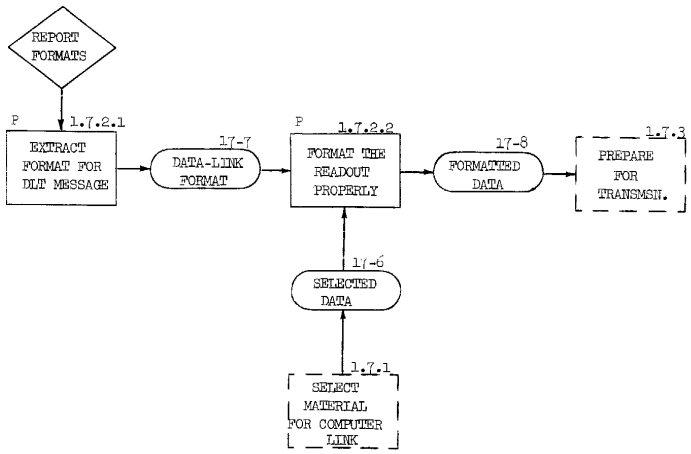

Figure 41 1.7.2 Format Data for Data Link Output

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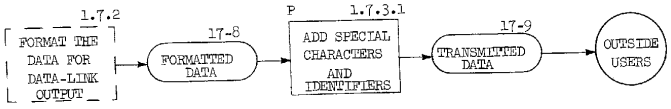

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Figure 42 1.7.3 Prepare For Transmission

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TABLE XVI

FILE REQUIREMENTS FOR COMPUTER-TO-COMPUTER LINK OPERATION

FILE	PROCESS	AVERAGE ACCESSES/DAY
REPORTS FORMAT	1.7.2.1	600.

are shown in Figures 43 through 50. The essential inputs to these activities are the Status List and the Working File. The Working File contains the individual installation readouts for a particular mission. The generation of first and second phase reports normally begins when all of the appropriate installation readouts, i.e. those required for inclusion in the specific report have completed the approval cycle.

The Status List, initially created by the pre-readout target prediction process, is sorted according to report formats and is used in extracting data from the Working File. The general procedure is to first sort that part of the Status List which pertains to the report according to the required contents of the report. This constitutes the index to the report and provides an ordered list which can be used to select data from the Working File. In the case of "sterilized" reports, the Status List passes through another process in which only sterile targets are selected for inclusion. The report is assembled using data from the Working File and supplementary data such as the Preface and the Highlights which have been keyed-in. The assembled report is edited and the mats are printed, if required. The edited report is saved and used to make up the cable version.

Second Phase Reports of targets not on the COMIREX list but exhibiting significant change, new targets, and OB data are prepared in a cable version only.

3.1.8.2 Equipment Utilization

Final preparation of First and Second Phase Reports involves a "last look" at the page text as it will appear in the final reports, the generation of mats for PSD using a high speed computer printer and the preparation of a paper tape and verification copy of the cable version of the report. Because of extreme variability in the volume of data reported for individual missions, time estimates are based on 600 pages per month of output text in the summary of utilization shown in Table XVII.

The Teletype Printer and paper tape punch are driven directly from the central computer.

3.1.8.3 File Requirements

Table XVIII shows the files and average daily access rates required for this activity.

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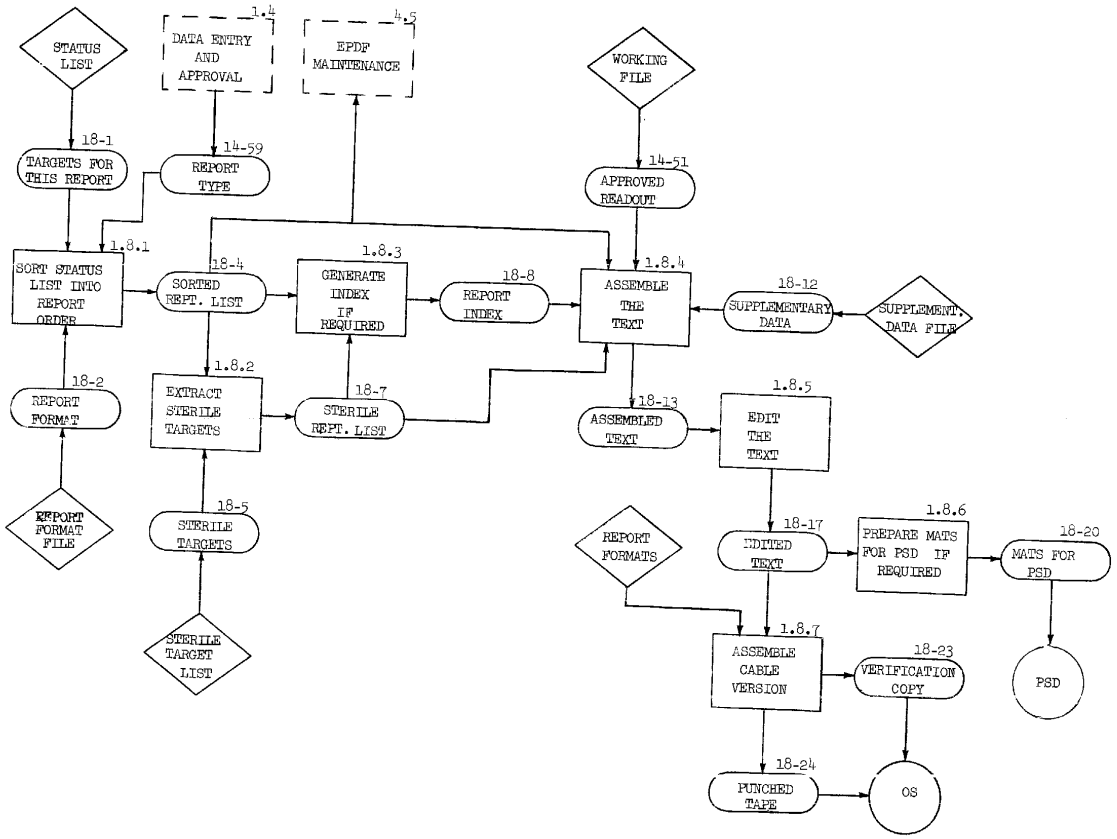

Figure 43 1.8 First and Second Phase Report Production

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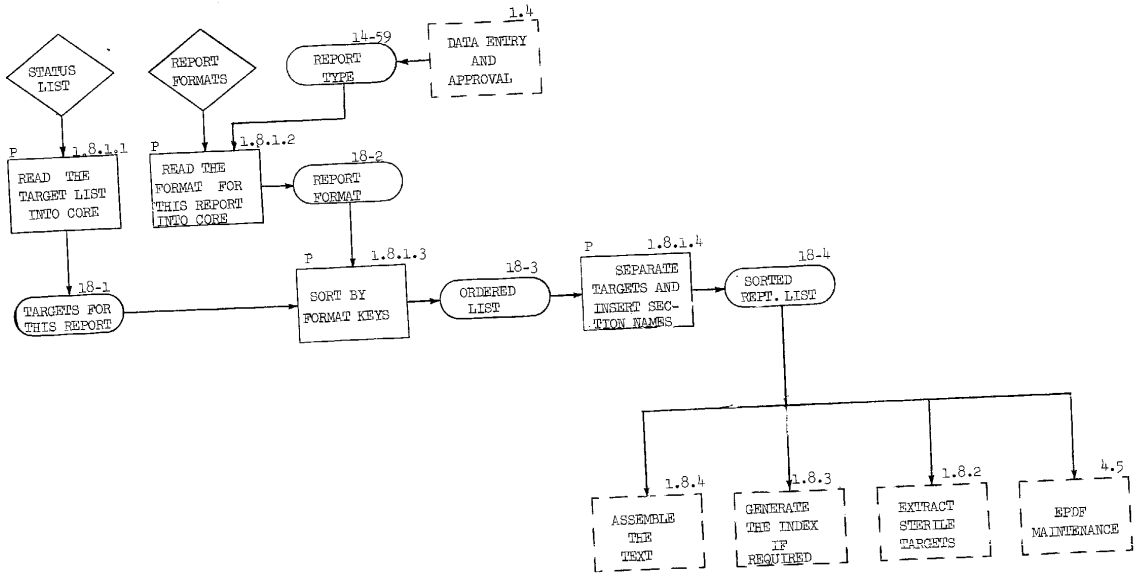

Figure 44 1.8.1 Sort Status List into Report Order

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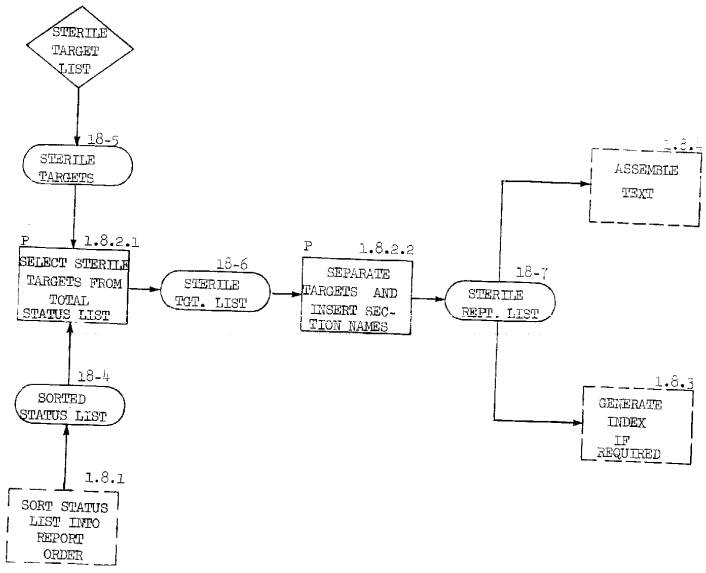

Figure 45 1.8.2 Extract Sterile Targets

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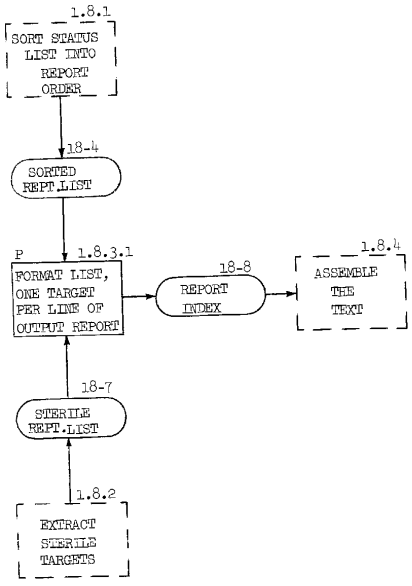

Figure 46 1.8.3 Generate Index (If Required)

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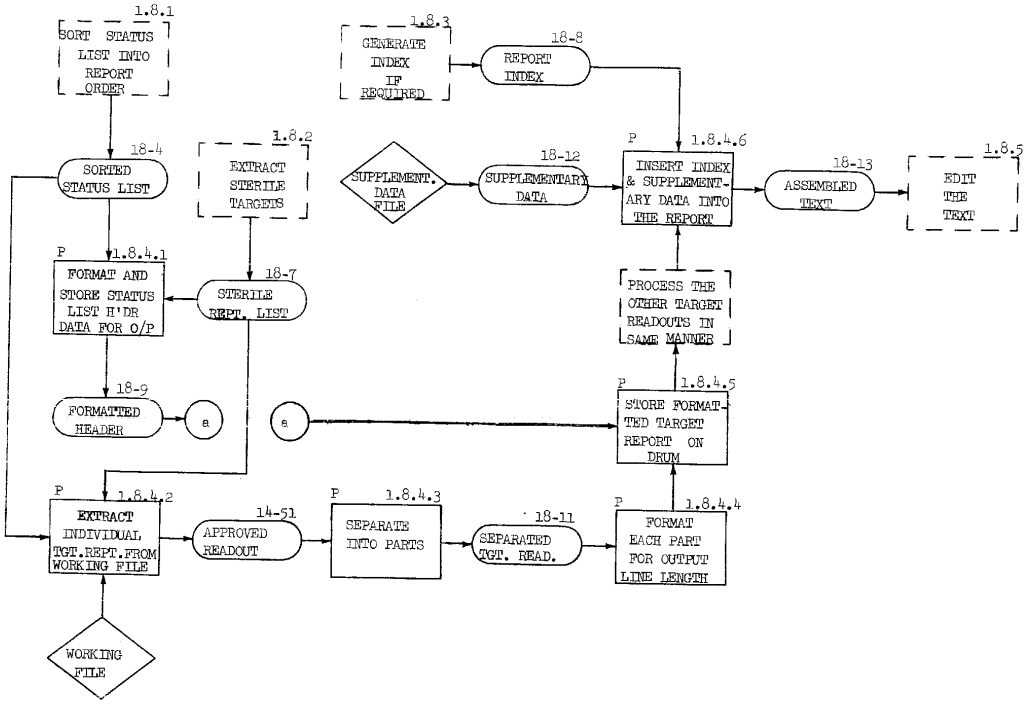

Figure 47 1.8.4 Assemble Text

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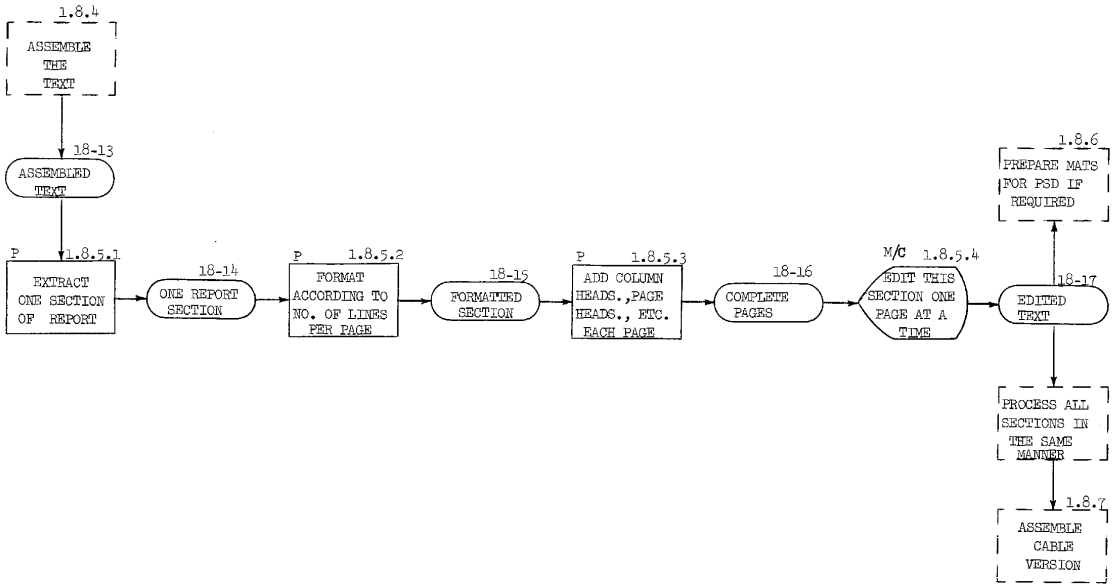

Figure 48 1.8.5 Edit Text

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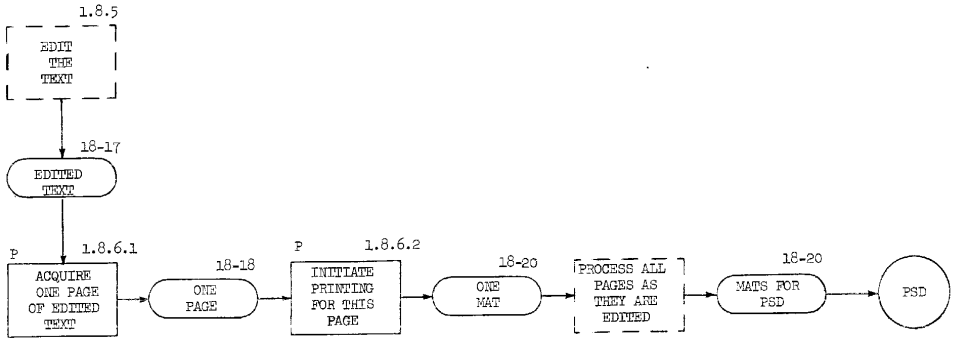

Figure 49 1.8.6 Prepare Mats for PSD (If Required)

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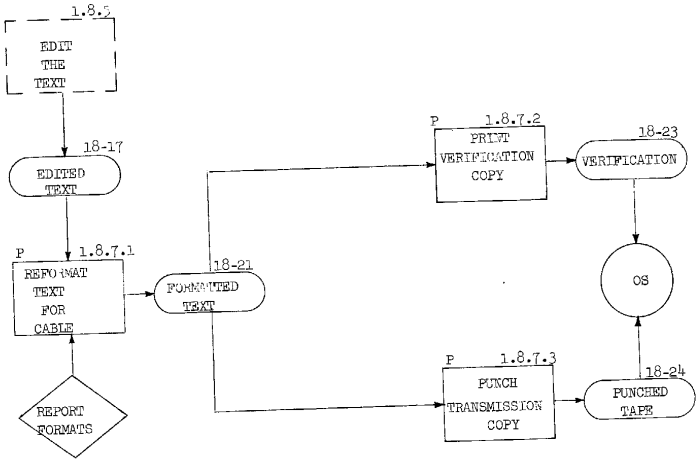

Figure 50 1.8.7 Assemble Cable Version

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TABLE XVII

EQUIPMENT UTILIZATION FOR FIRST AND SECOND PHASE REPORT PRODUCTION

EQUIPMENT	PROCESS	INTERFACE	FREQUENCY	HOURS/MO.	REMARKS
Editing Console	1.8.5.4	18-17	once/page	24.0	2.5 min./page
Printer (High Speed)	1.8.6.2	18-19	600 page/mo.	1.0	600 lines/min. 54 lines/page
TTY Printer	1.8.7.3	18-23	600 page/mo.	6.2	25 characters/second
TTY Punch	1.8.7.4	18-24	600 page/mo.	6.2	25 characters/second (560,000 characters)

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TABLE XVIII

FILE REQUIREMENTS FOR FIRST AND SECOND PHASE REPORT PRODUCTION

FILE	PROCESS	AVERAGE ACCESSES/DAY
WAIT LIST	1.8.1.1	21.
REPORT FORMATS	1.8.1.2	21.
STERILE TARGET LIST	1.8.2.1	21.
WORKING FILE	1.8.4.2	600.
SUPPLEMENTARY DATA	1.8.4.6	600.

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3.2 Detailed Reporting

3.2.1 Basic Intelligence Readout

3.2.1.1 Activity Description

Photo intelligence community planning allots Phase III interpretation to specific agencies. The Center has this responsibility in certain areas, which includes the provision of new Basic Reports and updates, on a scheduled or as required basis, for specific types of installations. In discharging this responsibility, the Center is also responsive to both external requests and internal recommendations.

Figures 51 through 54 illustrate this activity. When assigned to preparation of a new report or update, the PI requests and obtains all of the installation data in the data base (excluding the complete history) concerning the subject location. These data provide references to film which may then be selectively requested and references to source documents which, along with the current report (if the task is an update) may be obtained prior to readout.

During readout and preparation of the report or update, the PI has rapid access, through a console or by calling on an Information Specialist, to the entire data base. One of the initial activities in preparing an expanded report or update is the acquisition of new or revised site plots, which are normally incorporated in expanded basic reports. As illustrated, the preparation of annotated photographic prints which will be included in basic reports is delayed until Team Captain approval of the draft report has confirmed the requirement.

3.2.1.2 Equipment Utilization

During readout of film and preparation of text for Basic Intelligence Reports, query consoles, high speed printers for hard copy preparation of data to be used during the interpretation process and simple keyboard entry units through which requests for film and documents may be entered, are utilized.

Table XIX shows this equipment and the expected utilization of each device during the performance of this activity.

3.2.1.3 File Requirements

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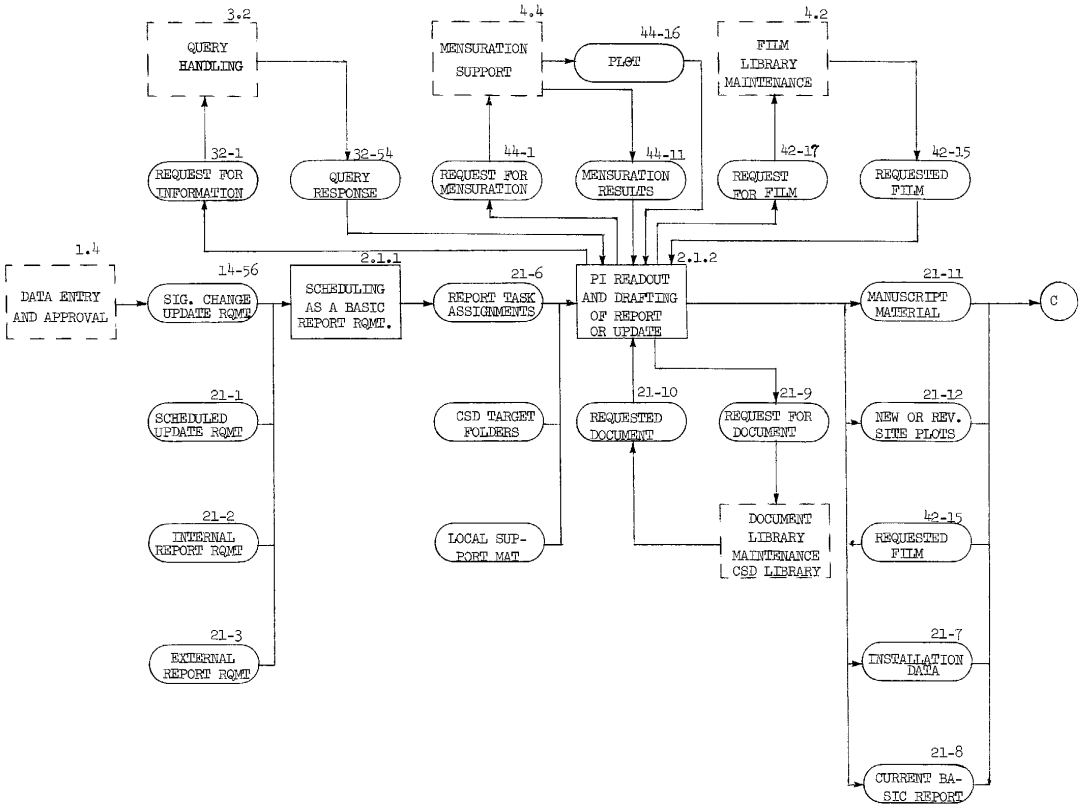

Figure 51 2.1 Basic Intelligence (Phase III) Readout Sheet 1 of 2

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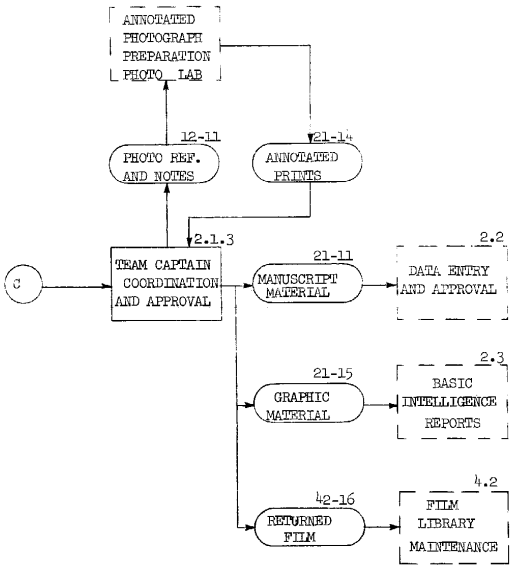

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Figure 51 (cont'd) 2.1 Basic Intelligence (Phase III) Readout

Sheet 2 of 2

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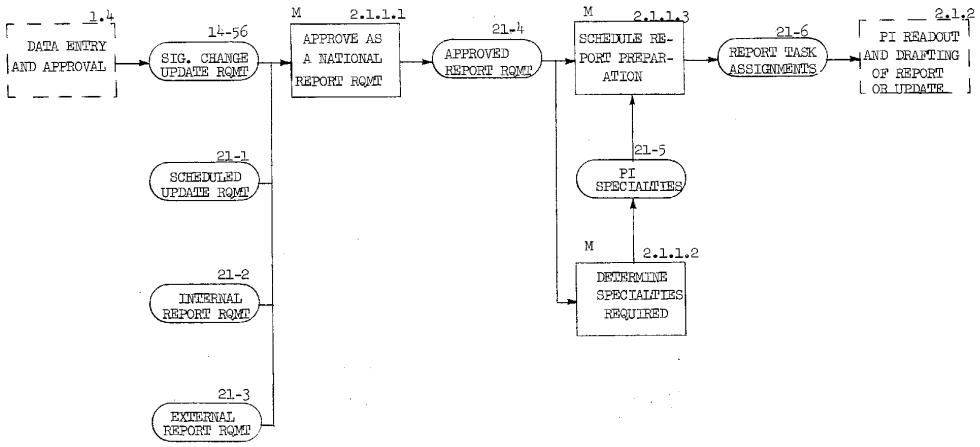

Figure 52 2.1.1 Scheduling as a Basic Report Requirement

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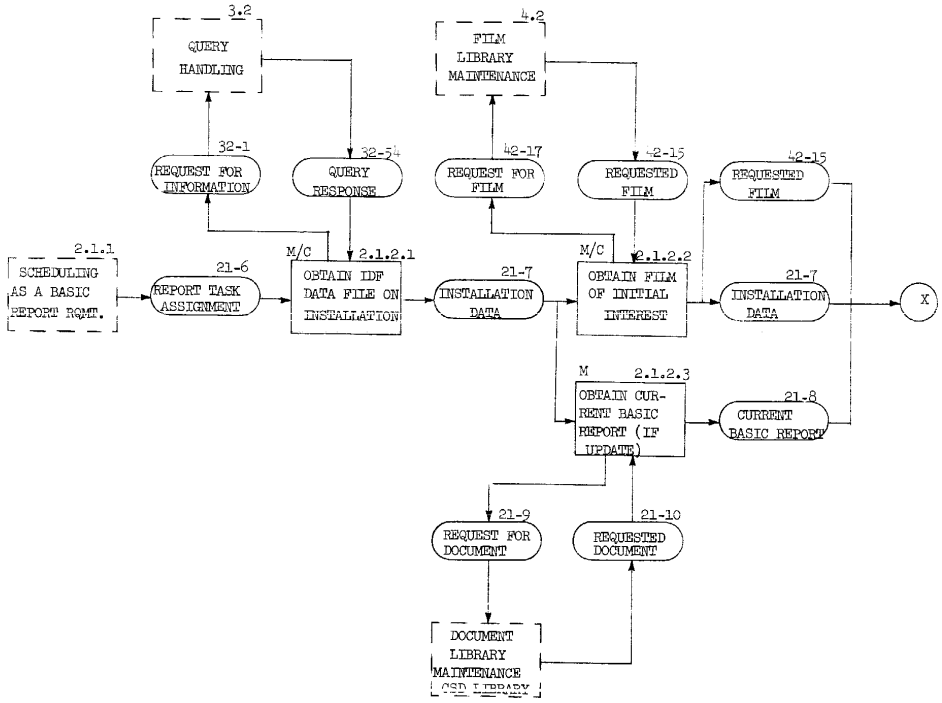

Figure 53 2.1.2 PI Readout and Drafting of Report or Update

Sheet 1 of 2

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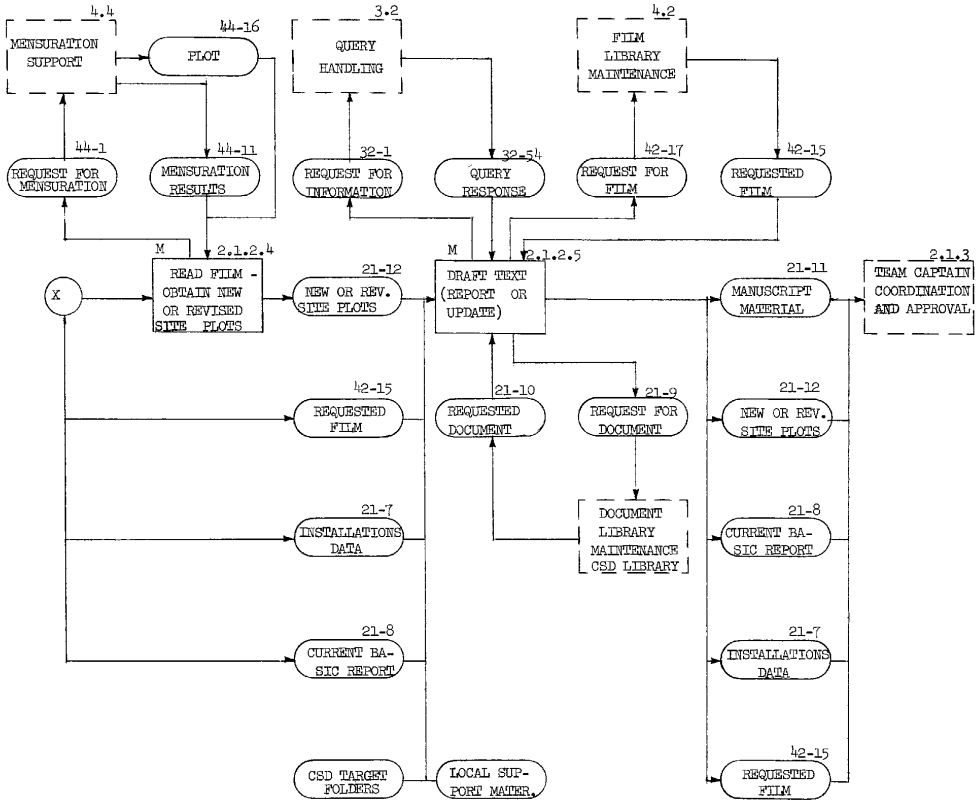

Figure 53 (cont'd) 2.1.2 PI Readout and Drafting of Report or Update Sheet 2 Of 2

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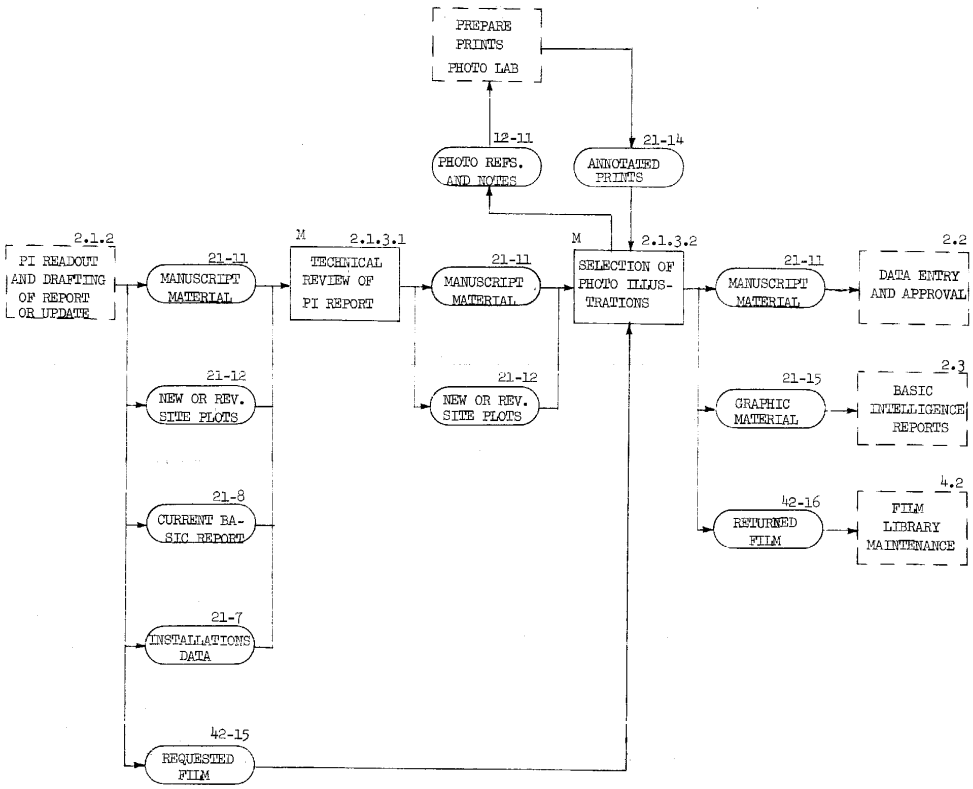

Figure 54 2.1.3 Team Captain Coordination and Approval

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TABLE XIX

EQUIPMENT UTILIZATION DURING BASIC INTELLIGENCE READOUT

EQUIPMENT	PROCESS	INTERFACE	FREQUENCY	HOURS/MO.	REMARKS
Query/Response Device	2.1.2.1	32-1 32-54	once/report	13.3	1700 - 2600 reports per year
	2.1.2.5	32-1 32-54	1/7 reports	2.0	Secondary requests
Keyboard Entry	2.1.2.3 2.1.2.2 2.1.2.5	21-9 42-12 42-17	1400-1900/yr. 1700-2600/yr. 1/5 reports	5.0 5.0 1.0	2 min./request 2 min./request Secondary requests
Printer (High-Speed)	2.1.2.1	21-7	once/report	2.6	Hard copy version of query response

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3.2.2 Data Entry and Approval - Basic Reports

3.2.2.1 Activity Description

The functions involved in this activity (Figures 55 through 60) are analogous to those of the Data Entry and Approval of Immediate Reports. As in the latter, entry of the data is accomplished by means of a keyboard console, and display consoles are required for both verification and the editing functions.

However, there are two functions which are different. First the approval function is much simpler since the PI has had the opportunity to search a great deal of reference material, look at many photographs and consult the approval authority during his preparation of the report. Thus the approval authority has had the opportunity to give a great deal of guidance in the preparation of the report.

The second distinction is the requirement for selection of data which is to be included in the data base. Unlike the immediate reports there are no indications in the data itself which can be used for determining where to store the information. Thus it is necessary to manually select the portions for inclusion in the data base and to add indicators or tags to those portions which will be included. After such tags have been included the data is treated as "automatic" data during the Data Base Maintenance activity.

3.2.2.2 Equipment Utilization

The Entry and Approval of Basic Reports requires essentially the same equipment complement as is used for First and Second Phase Reports. Table XX summarizes the anticipated utilization of this equipment during the preparation of Basic Reports.

3.2.2.3 File Requirements

Table XXI shows the files and average daily access rates required for this activity.

3.2.3 Basic Intelligence Report Production

3.2.3.1 Activity Description

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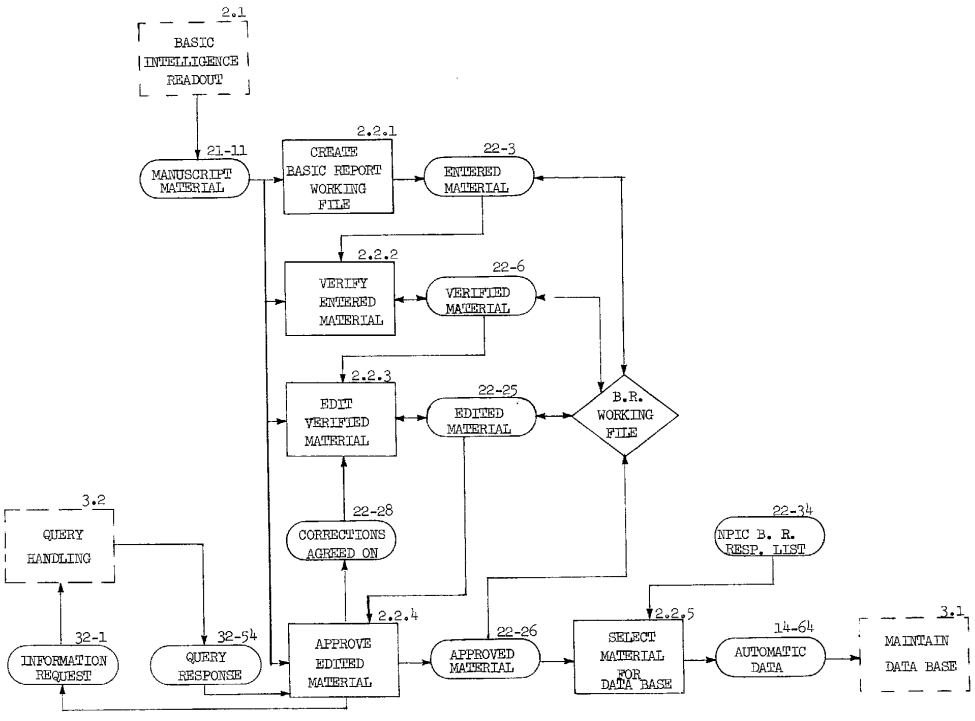

Figure 55 2.2 Data Entry and Approval - Basic Reports

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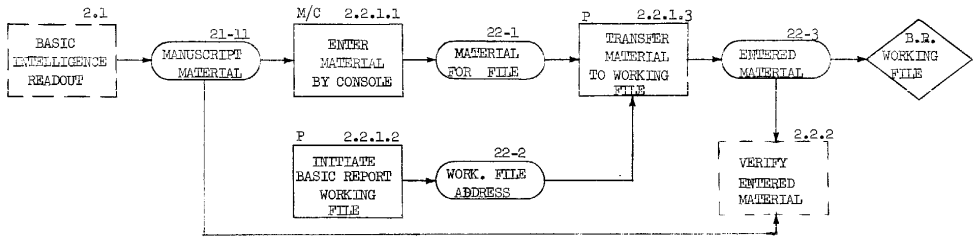

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Figure 56 2.2.1 Create Basic Report Working File

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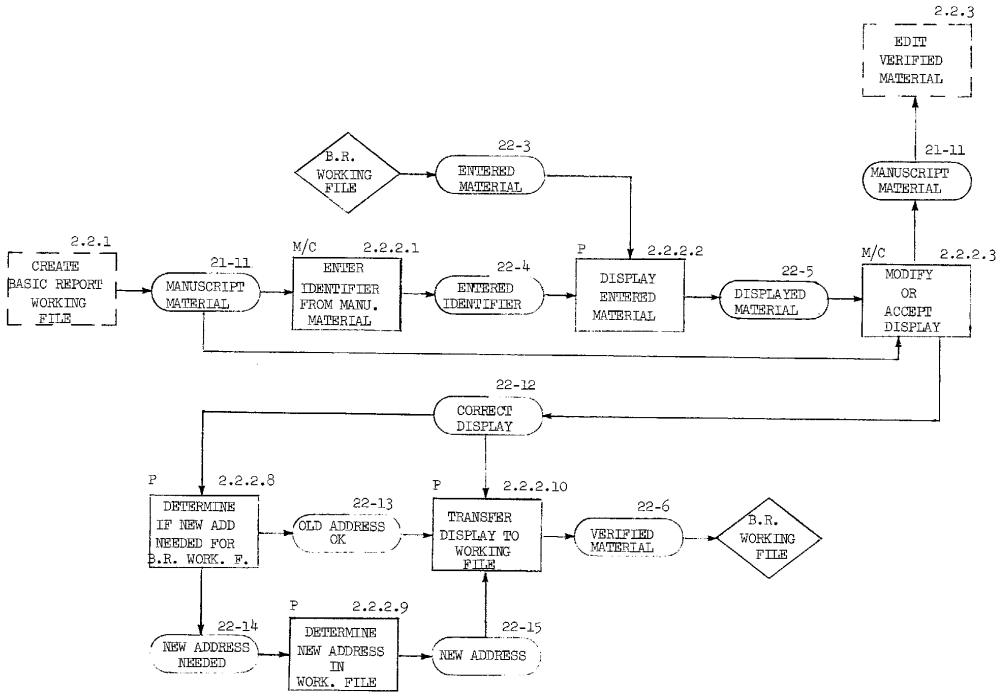

Figure 57 2.2.2 Verify Entered Material

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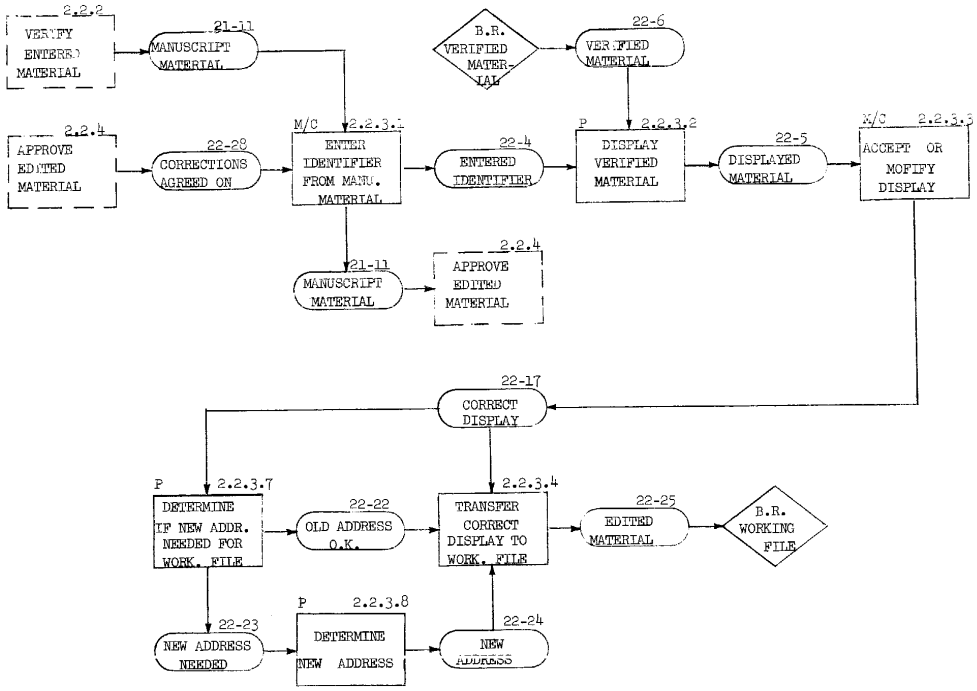

Figure 58 2.2.3 Edit Verified Material

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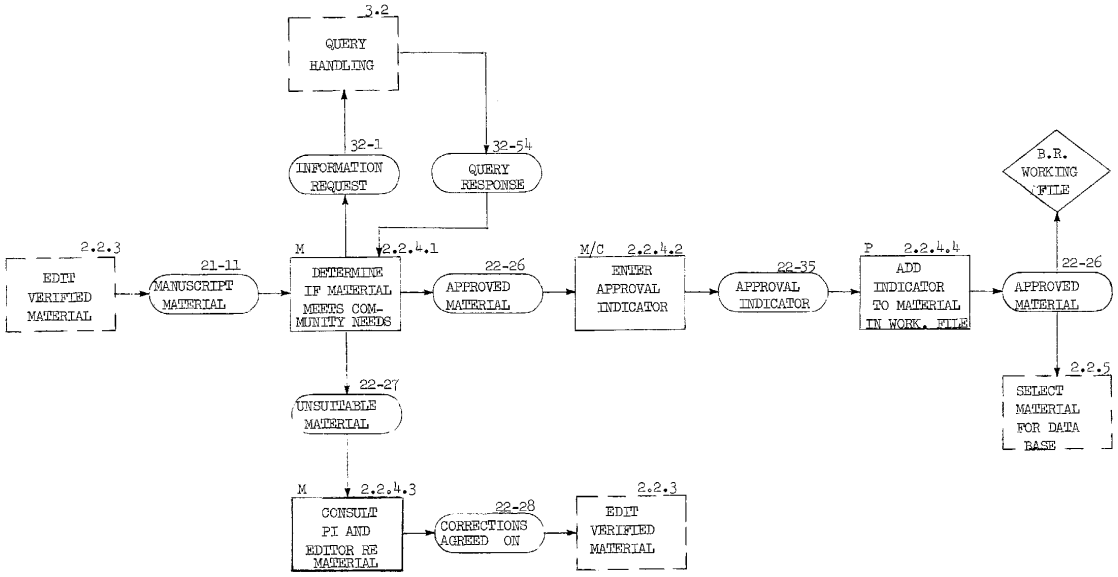

Figure 59 2.2.4 Approve Edited Material

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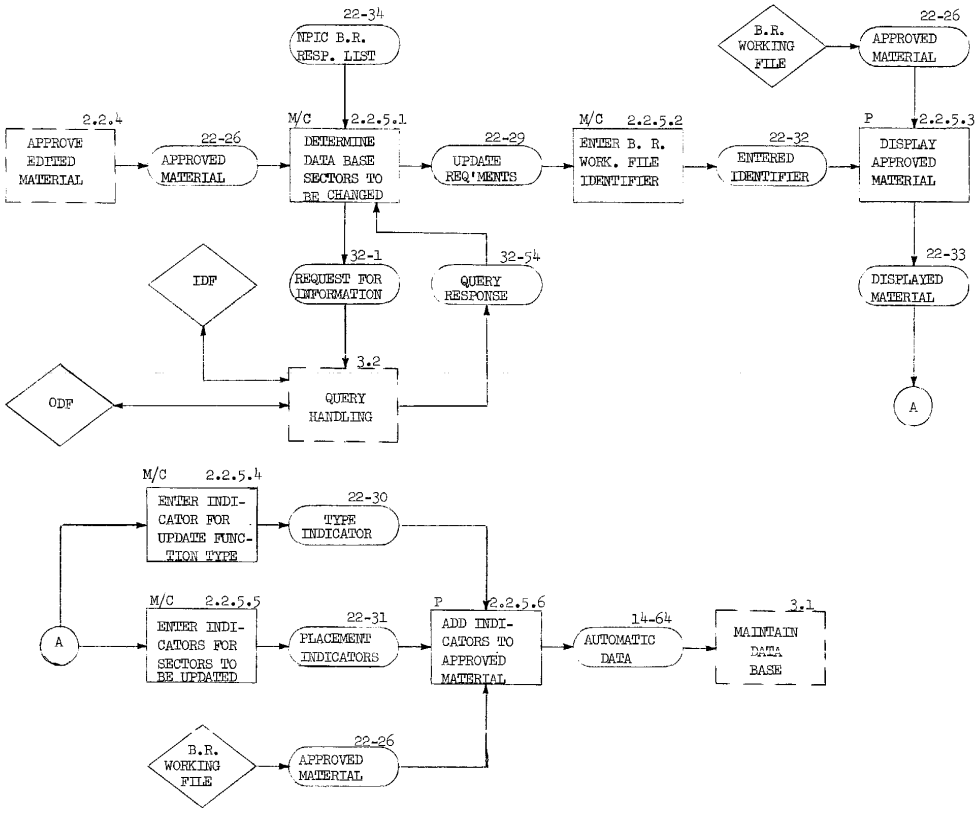

Figure 60 2.2.5 Select Material for Data Base

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TABLE XX

EQUIPMENT UTILIZATION DURING ENTRY AND APPROVAL OF BASIC REPORTS

EQUIPMENT	PROCESS	INTERFACE	FREQUENCY	HOURS/MO.	REMARKS
Keyboard Entry	2.2.1.1	22-1	2,000 pg./mo.	336.0	Includes new and updated versions of both brief and expanded reports
Input/Output Console with Edit Capability	2.2.2.1 2.2.2.2 2.2.2.3	22-4 22-5 22-6 22-7	1/report	300.0	Based on: 600 Reports/mo. 5 Pages/report 6 Min./page
	2.2.2.4 2.2.2.5 2.2.2.7	22-8 22-9 22-12			
	2.2.3.1 2.2.3.2 2.2.3.3 2.2.3.6	22-4 22-16 22-18 22-16	1/report	500.0	Based on: 600 Reports/mo. 5 Pages/report 10 Min./page
	2.2.4.1	32-1 32-54	1/report	10.0	1 min./report
	2.2.5.4 2.2.5.5	22-30 22-31	1/report 1/report	2.5	30 seconds/report
	2.2.5.1	32-1 32-54	1/report	20.0	2 min./report
		22-29	1/report	5.0	30 seconds/report

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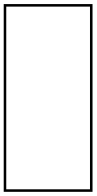

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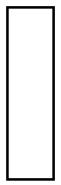

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TABLE XXI

FILE REQUIREMENTS FOR DATA ENTRY AND APPROVAL - BASIC REPORTS

FILE	PROCESS	AVERAGE ACCESSES/DAY
BASIC REPORTS WORKING FILE	2.2.1.3	21.
	2.2.2.2 2.2.2.3 2.2.2.10	21.
	2.2.3.2 2.2.3.9	21.
	2.2.4.4	21.
	2.2.5.3 2.2.5.6	21.
IDF	2.2.5.1	21.
ODF	2.2.5.1	21.

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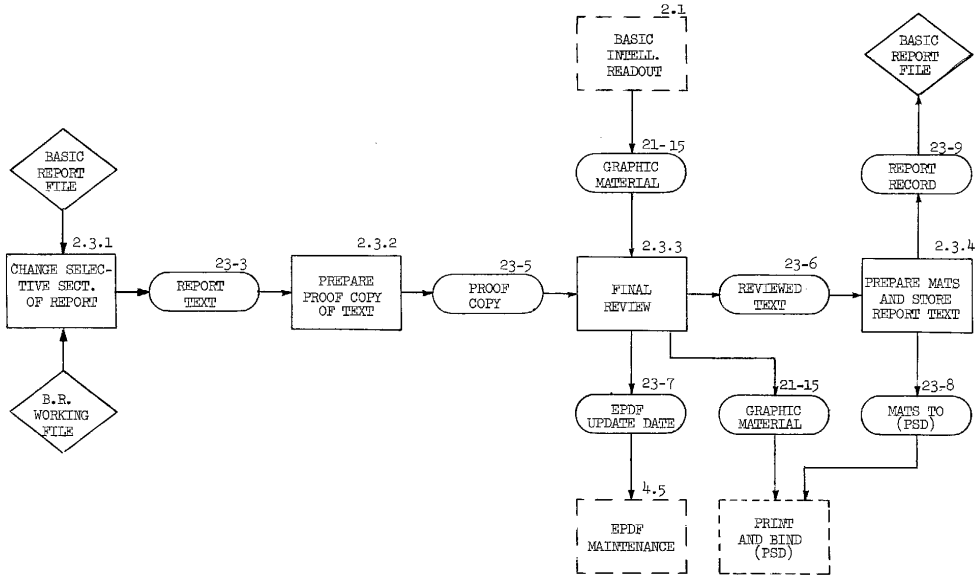

Figure 61 2.3 Basic Intelligence Report Production

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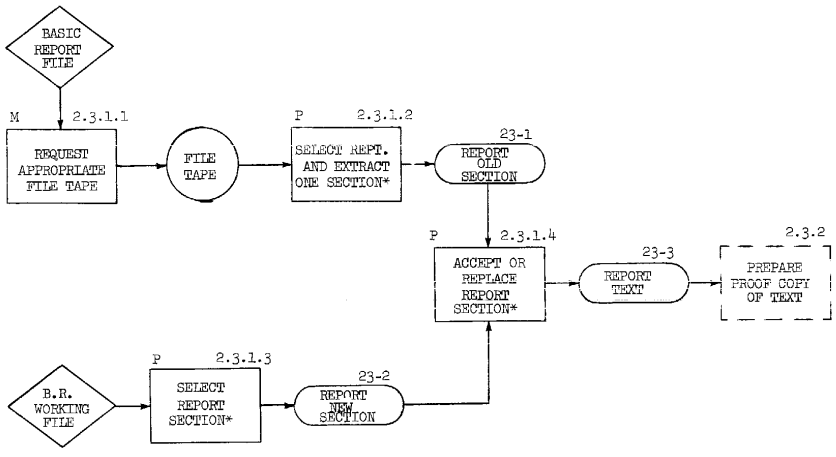

* REPEAT FOR ALL SECTIONS

Figure 62 2.3.1 Change Selective Sections of Report

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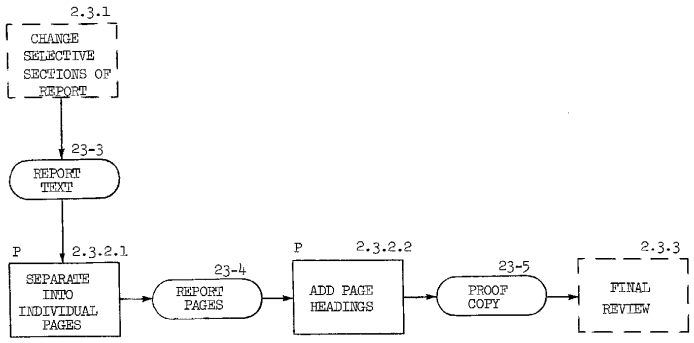

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Figure 63 2.3.2 Prepare Proof Copy of Text

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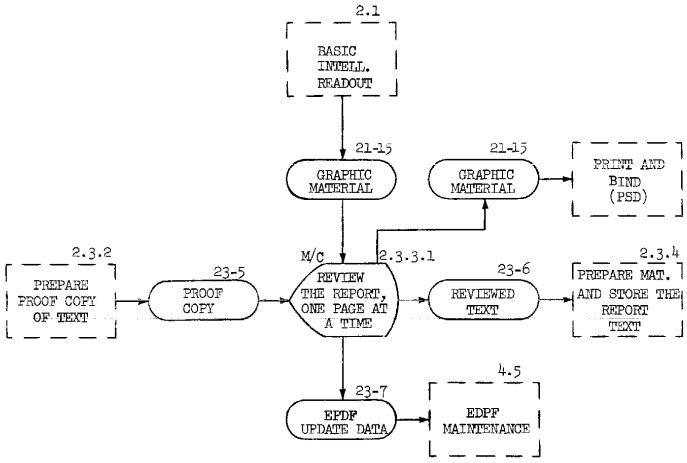

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Figure 64 2.3.3 Final Review

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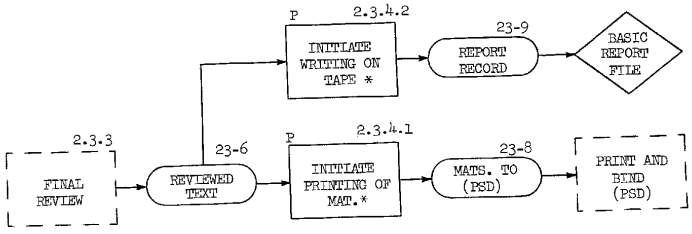

* Process all pages in same way

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Figure 65 2.3.4 Prepare Mats and Store Report Text

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The updating of an already existing report involves changing selected sections of the report. Some new photo interpretation work is done which provides new information for the given report. The sections which have been altered, possibly with console assistance, are merged with the remaining sections which are extracted from a magnetic tape file. The updated report is then reviewed in the same manner as the original report before it is printed for distribution and stored back into the tape file.

3.2.3.2 Equipment Utilization

The final preparation of Basic Intelligence Reports as hard copy documents is complete in the IIS when a punched paper tape to drive automatic typesetting equipment has been prepared. In addition to the paper tape punch, an editing console for final review is provided. Table XXII shows the expected utilization of these devices.

3.2.3.3 File Requirements

Table XXIII shows the files and average daily access rates required for this activity.

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TABLE XXII

EQUIPMENT UTILIZATION FOR BASIC INTELLIGENCE REPORT PRODUCTION

EQUIPMENT	PROCESS	INTERFACE	FREQUENCY	HOURS/MO.	REMARKS
Input/Output Console	2.3.3.1	23-5	3000 page/mo.	150.0	3 min./page
Paper Tape Punch	2.3.4.1	23-8	600 reports/mo.	16.7	110 char./second punching speed. Each report averages 11,000 characters.

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TABLE XXIII

FILE REQUIREMENTS FOR BASIC INTELLIGENCE REPORTS PRODUCTION

FILE	PROCESS	AVERAGE ACCESSES/DAY
BASIC INTELLIGENCE REPORT FILE	2.3.1.1	21.
	2.3.4.2	21.
BASIC REPORT WORKING FILE	2.3.1.3	21.

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3.3 Data Base Activities

3.3.1 Data Base Maintenance

3.3.1.1 Activity Description

The Data Base Maintenance activity provides the vehicle to (1) update existing files, e.g. ODF, IDF, MPF, MTF, and the EPDF, (2) create new files for the IIS, and (3) maintain system files. Included in System Files are all of the unique and broad term indices, and the Index Records (IR) used to locate sectors in a given unit record. Entry to this activity is by the means of automatic data (machine readable information which automatically triggers the operation of the maintenance programs) or manual data (keyed-in information which triggers the maintenance programs, e.g. a CSD correction to the Header sector).

This activity is entirely a computer program and hence the functions and processes shown on the Information Flow Diagrams (Figures 66 through 72) reflect a level of detail somewhat deeper than is prevalent in other activities of the IIS. It is felt that this greater detail is important in this case because of the criticality of the activity.

3.3.1.2 Equipment Utilization

Corrections, deletions or additions to the data base are, for the most part made automatically. However, there is still a considerable amount of manually entered data to be processed. This entry procedure, and a recall to verify the correctness of the entry requires Input/Output consoles. The processes which require such a device are shown in Table XXIV.

3.3.1.3 File Requirements

Table XXV shows the files and average daily access rates required for this activity.

3.3.2 Query Handling

3.3.2.1 Activity Description

This activity of the IIS provides NPIC users the capability to retrieve desired information from either the National Data Base located at NPIC or from external data bases via the COINS network. (See Figures 73 through

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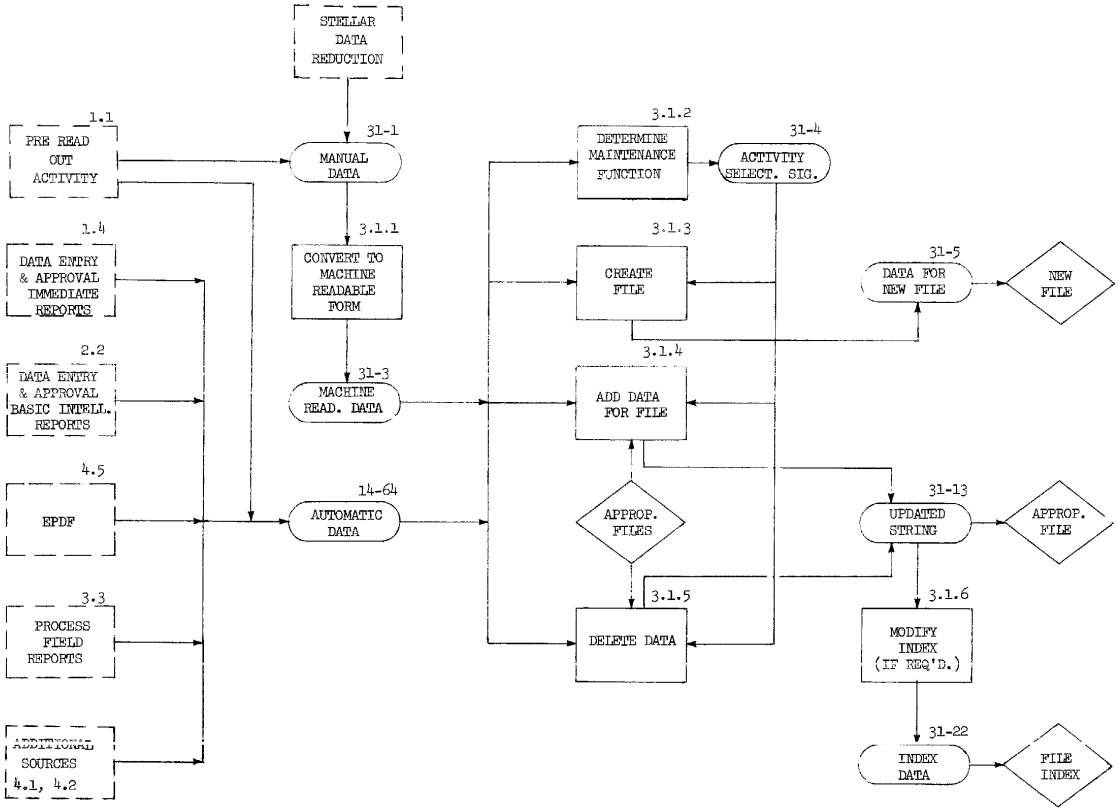

Figure 66 3.1 Data Base Maintenance

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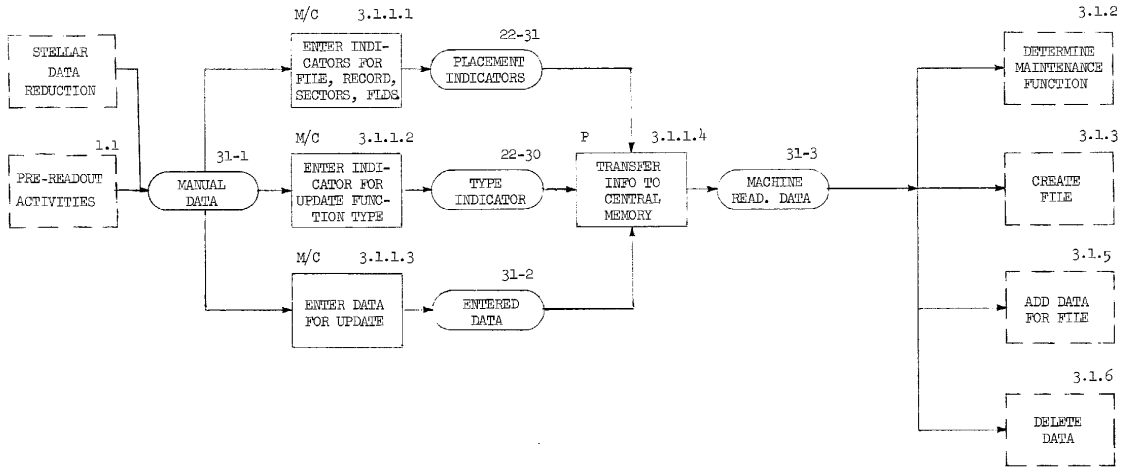

Figure 67 3.1.1 Convert to Machine Readable Form

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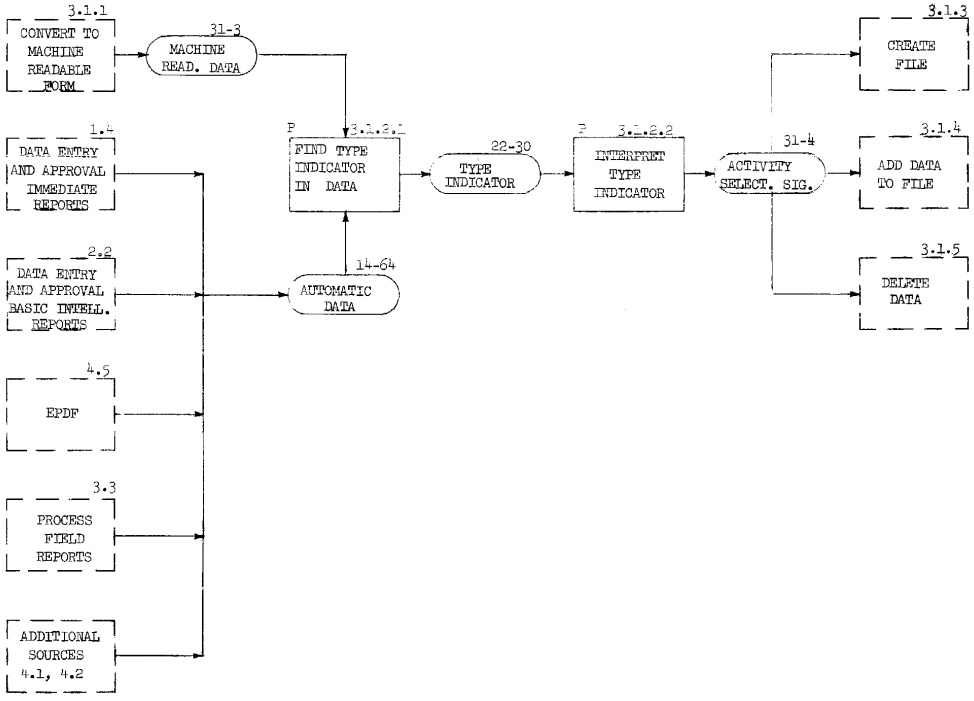

Figure 68 3.1.2 Determine Maintenance Function

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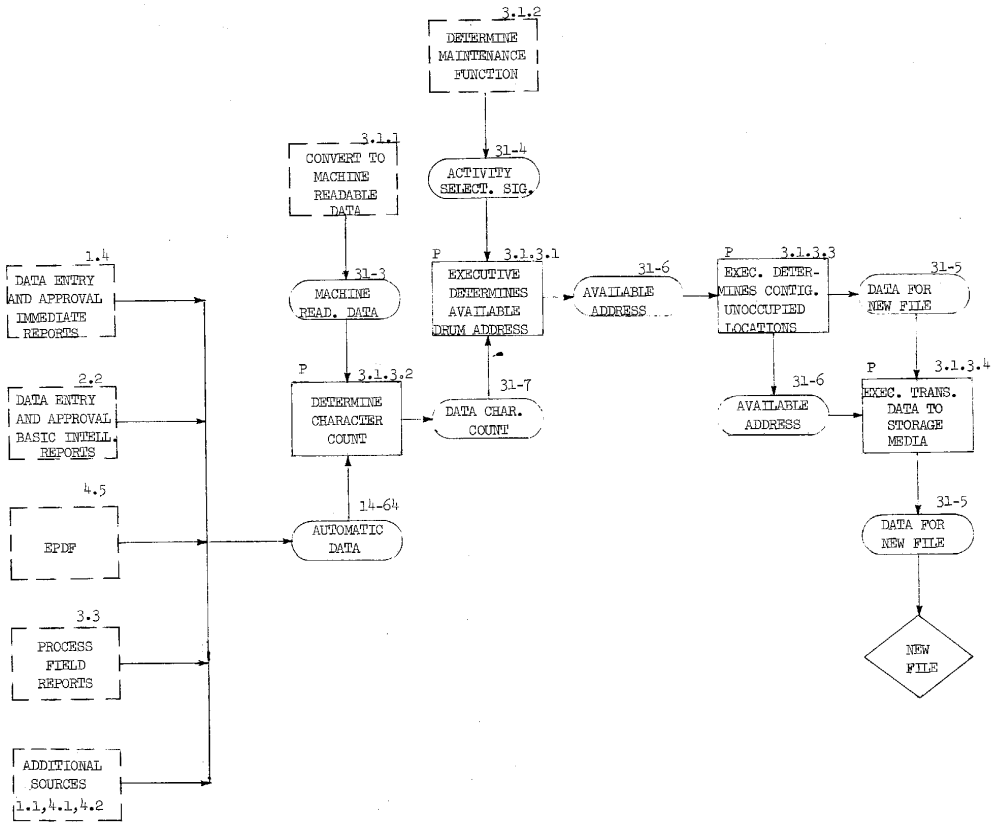

Figure 69 3.1.3 Create File

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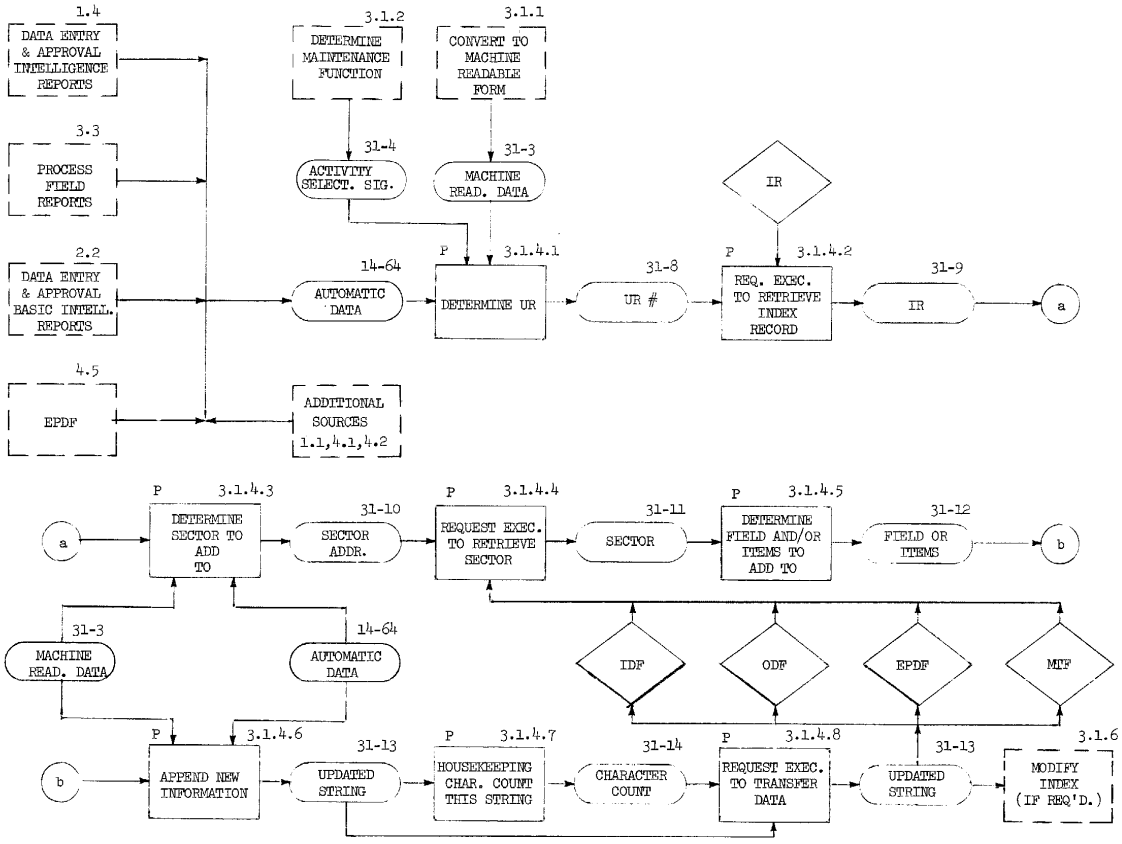

Figure 70 3.1.4 Add Data for File

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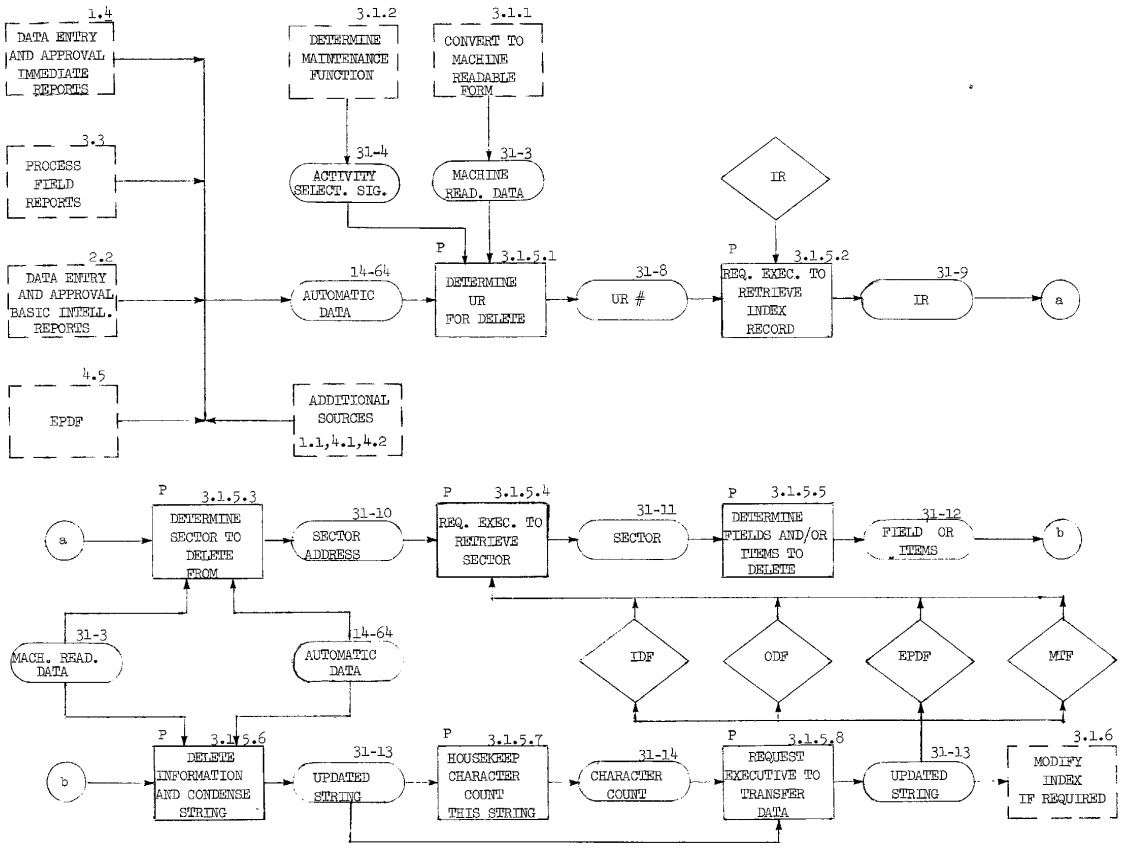

Figure 71 3.1.5 Delete Data

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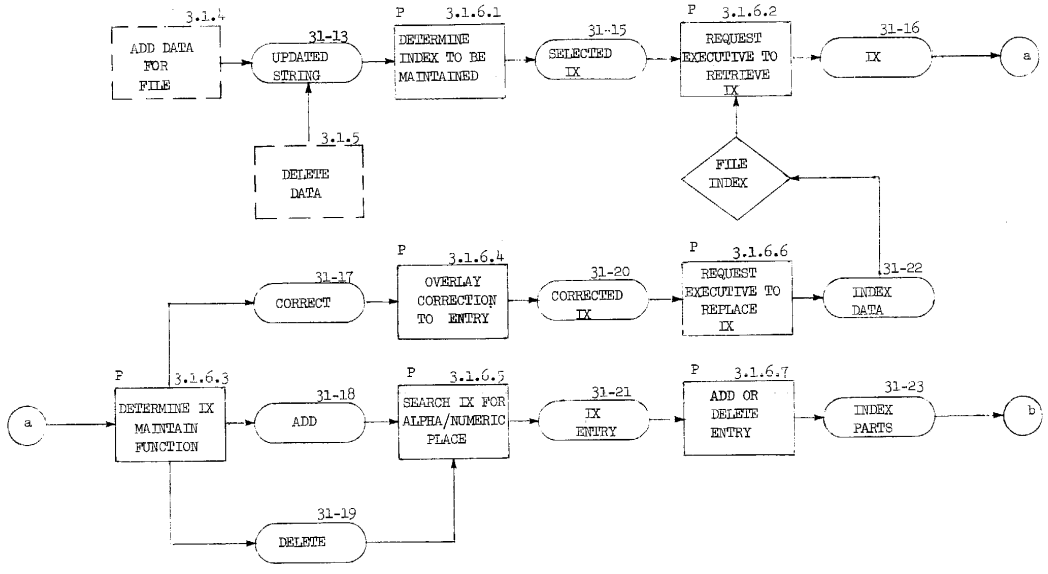

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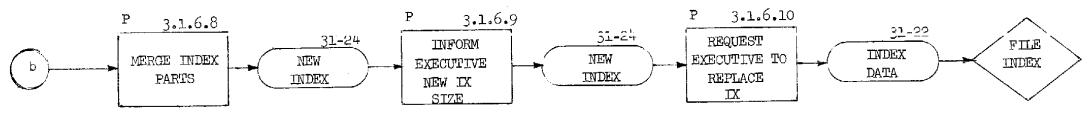

Figure 72 3.1.6 Modify Index (If Required)

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TABLE XXIV

EQUIPMENT UTILIZATION FOR DATA BASE MAINTENANCE

EQUIPMENT	PROCESS	INTERFACE	FREQUENCY	HOURS/MO.	REMARKS
Input/Output Console	3.1.1.1	22-31	once/entry	318.0	Estimates are based on updating of 4760 file sectors/mo.
	3.1.1.2	22-30	once/entry		500 characters/sector
	3.1.1.3	31-2	once/entry		4 min./sector

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TABLE XXV

FILE REQUIREMENTS FOR DATA BASE MAINTENANCE

FILE	PROCESS	AVERAGE ACCESSES/DAY
NEW FILE	3.1.3.4	5.
INDEX RECORD	3.1.4.2 3.1.5.2	2051.
IDF	3.1.4.4 3.1.4.8 3.1.5.4 3.1.5.8	1115.
ODF	3.1.4.4 3.1.4.8 3.1.5.4 3.1.5.8	8408.
EPDF	3.1.4.4 3.1.4.8 3.1.5.4 3.1.5.8	46.
MTF	3.1.4.4 3.1.4.8 3.1.5.4 3.1.5.8	50.
FILE INDEX	3.1.6.2 3.1.6.6 3.1.6.10	30.

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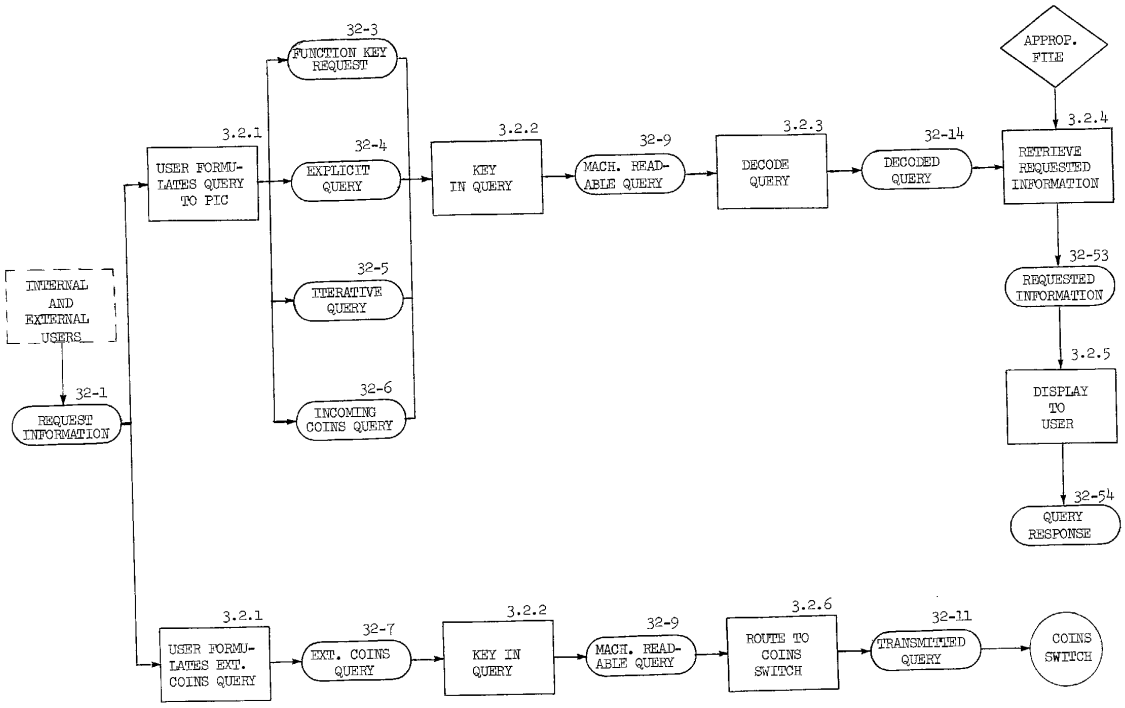

Figure 73 3.2 Query Handling

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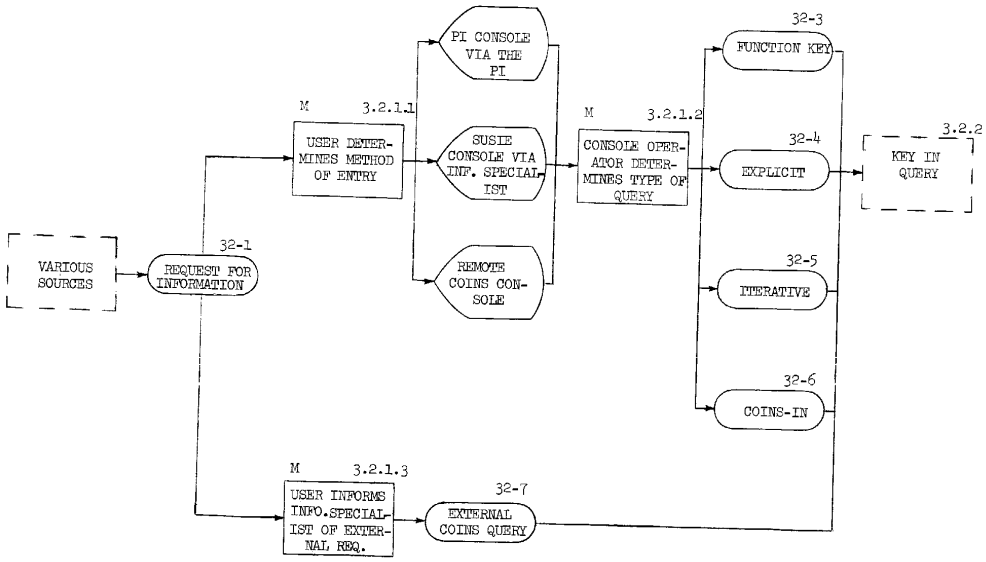

Figure 74 3.2.1 User Formulates Query to PIC (or Ext. COINS Query)

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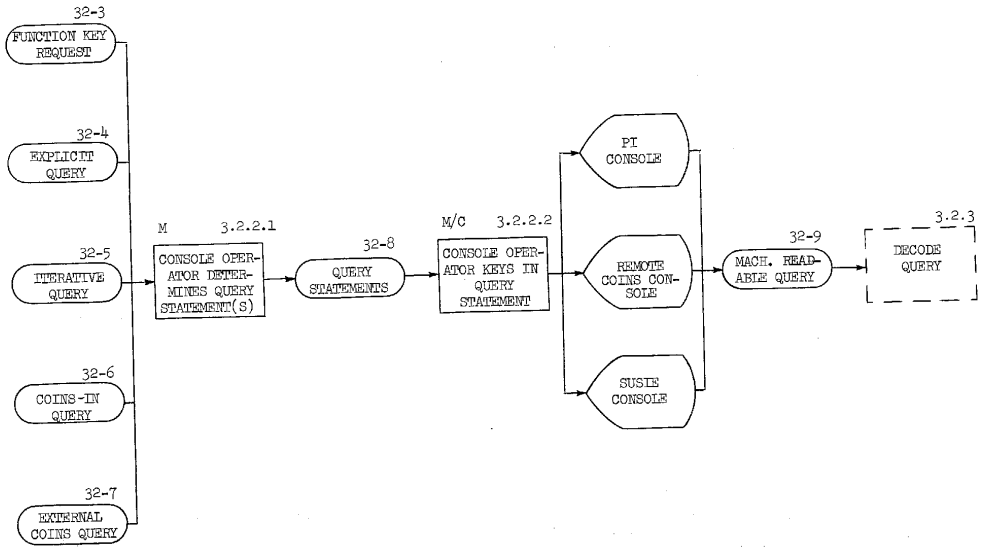

Figure 75 3.2.2 Key-In Query

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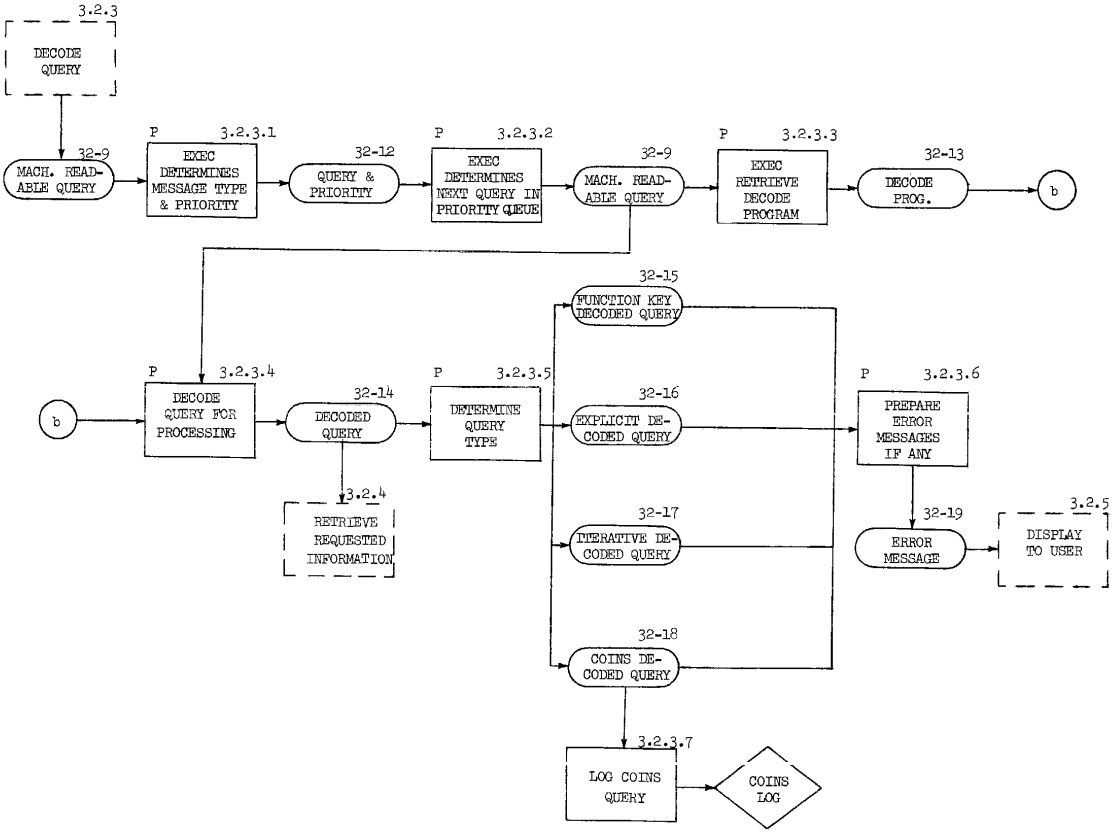

Figure 76 3.2.3 Decode Query

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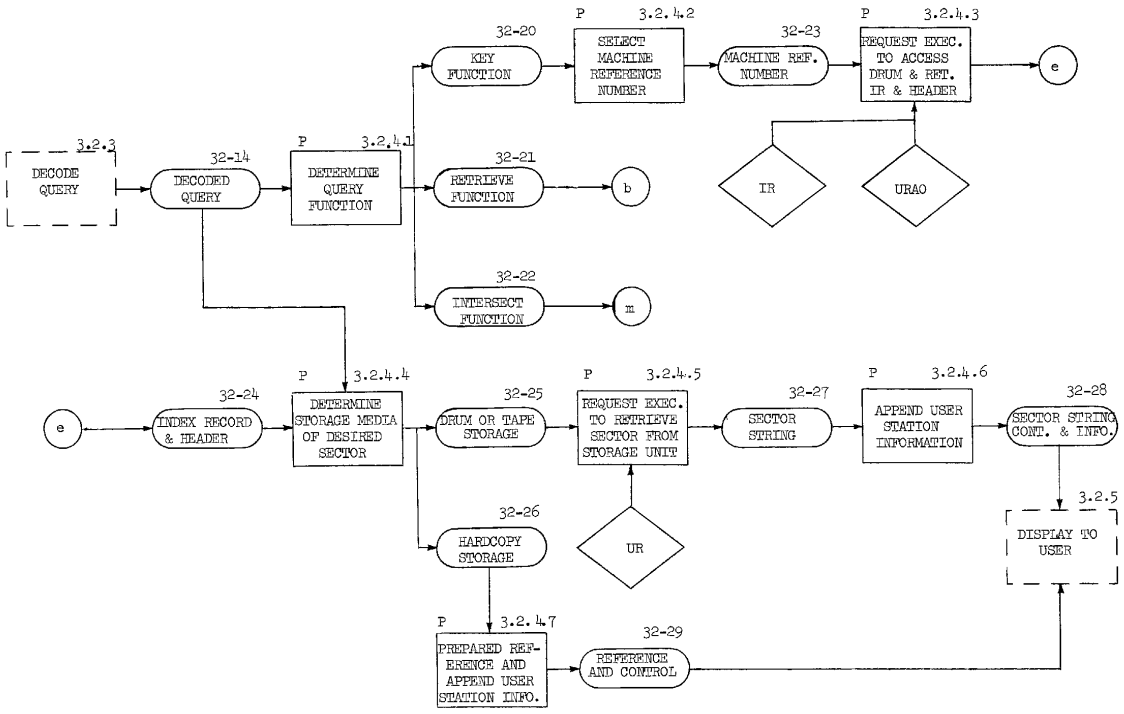

Figure 77 3.2.4 Retrieve Required Information Sheet 1 of 5

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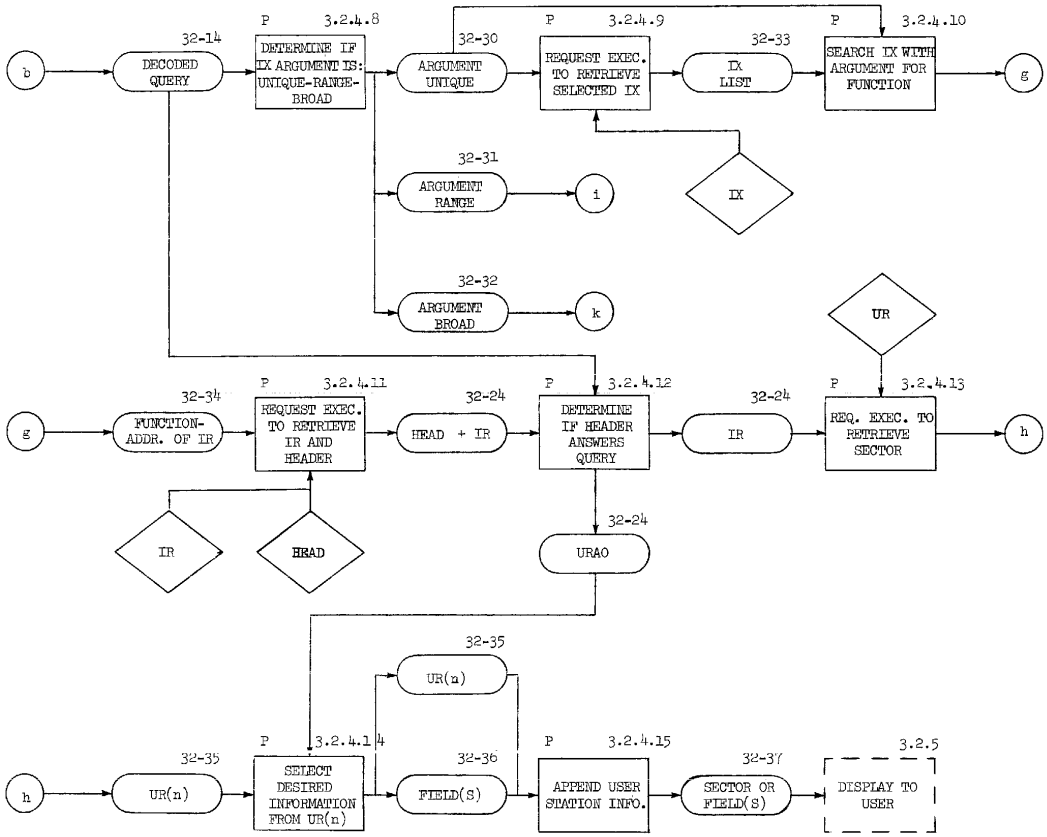

Figure 77 (cont'd) 3.2.4 Retrieve Required Information

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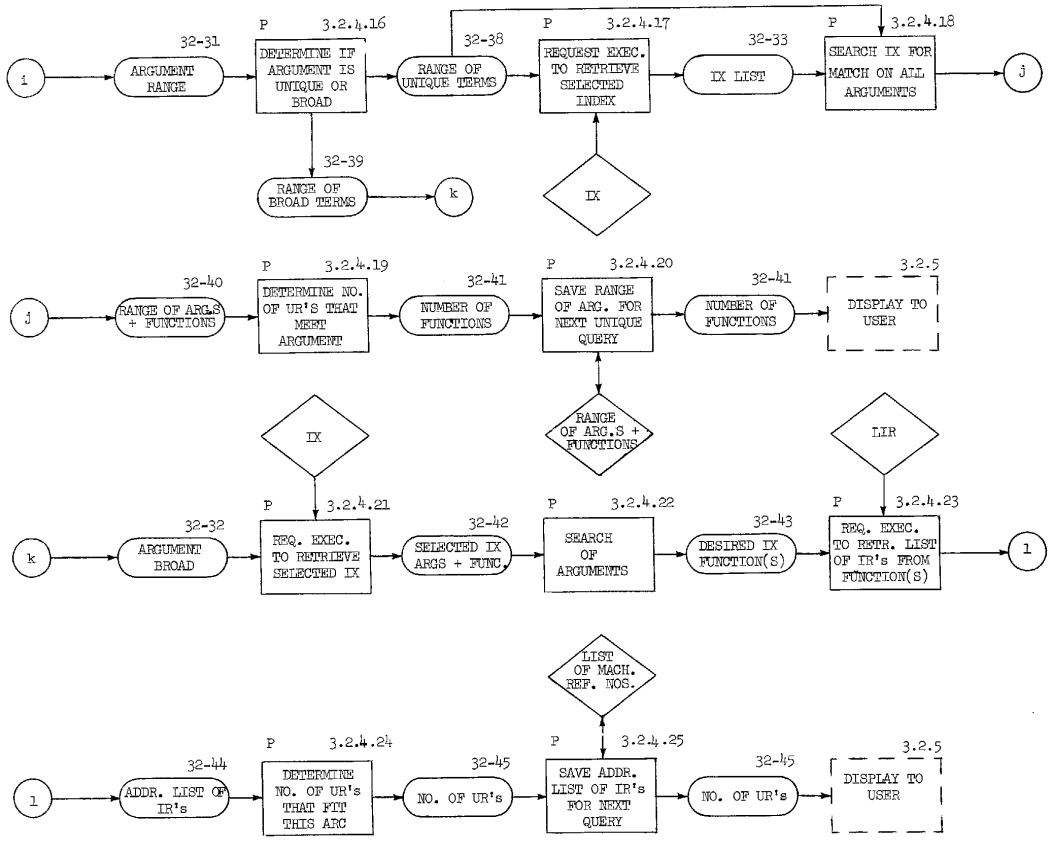

Figure 77 (cont'd) 3.2.4 Retrieve Required Information

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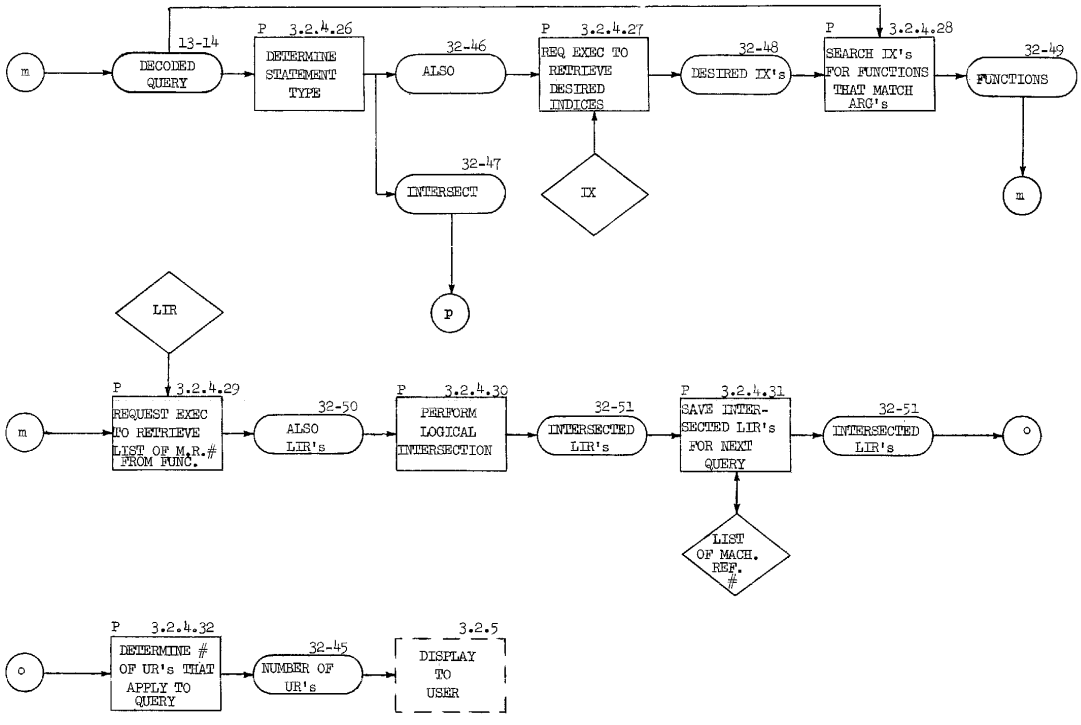

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Figure 77 (cont'd) 3.2.4 Retrieve Required Information Sheet 4 of 5

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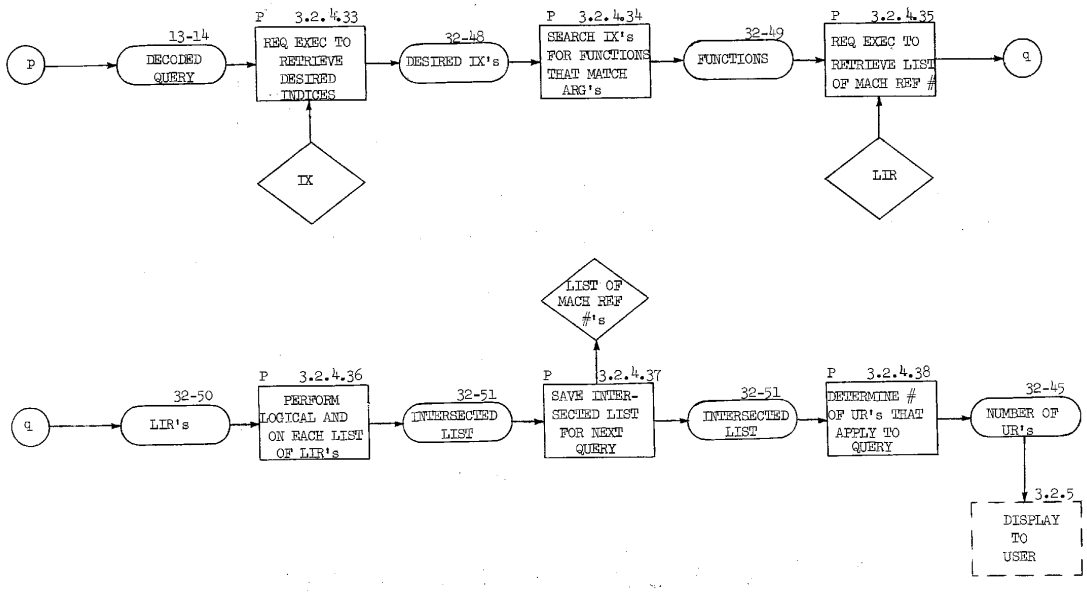

Figure 77 (cont'd) 3.2.4 Retrieve Required Information

Sheet 5 of 5

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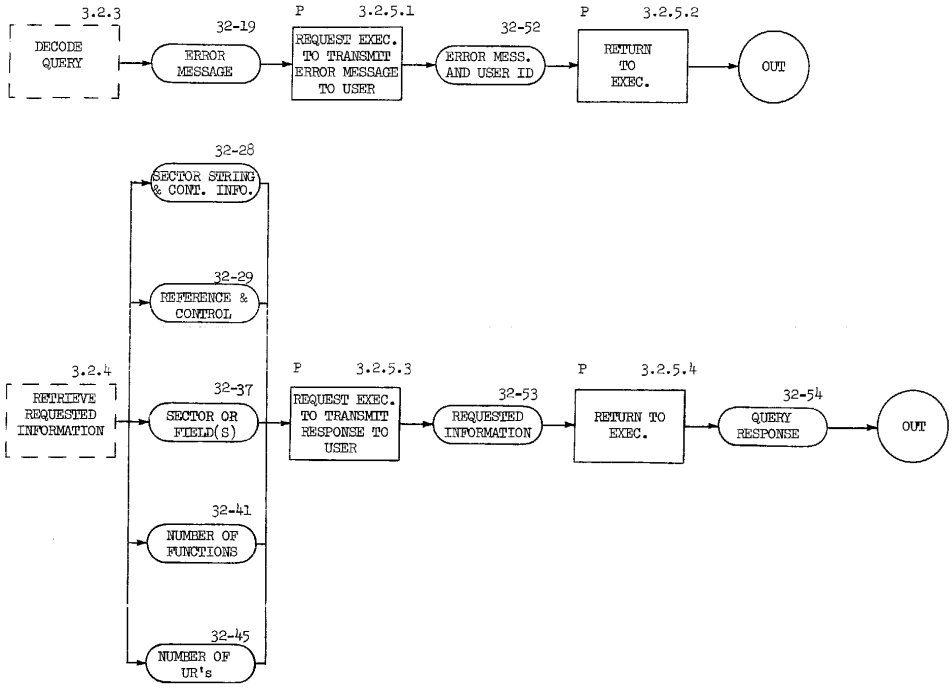

Figure 78 3.2.5 Display to User

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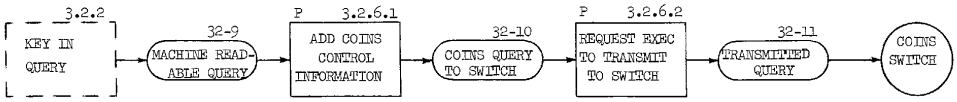

Figure 79 3.2.6 Route to COINS Switch

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1. The user determines what information he requires.

2. The information requirement is translated to a computer language (query statements) either by the user or by an Information System Specialist (SUSIE).

3. The query statements are keyed into the IIS via a remote keyboard.

4. The requested information is retrieved by the IIS and displayed (printed) at the user's remote console.

It should be noted that function 3.2.1 (Figure 74), User Formulates Query, is a mental process common to all queries to the system, i.e. one must decide the type of query to ask of the system in order to retrieve the appropriate information.

This Query Handling activity services requests from several activities:

1.2 Phase I Readout
1.3 Phase II Readout
1.4 Data Entry and Approval - Immediate Reports
1.6 Briefing Board Generation
2.1 Basic Intelligence Readout
2.2 Data Entry and Approval - Basic Reports
4.6 CSD New Target Initiation

3.3.2.2 Equipment Utilization

The Query Handling activity is, in most cases, a sub-function of other activities of NPIC which are discussed elsewhere in this volume. In these cases, the utilization of consoles is shown as a part of the activity. There will, however, be some number of miscellaneous queries not accounted for by these activities. The required Input/Output console time for these (estimated at about 500 per day) is shown in Table XXVI.

3.3.2.3 File Requirements

Table XXVII shows the files and average daily access rates required for this activity.

3.3.3 Processing of Field Reports

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TABLE XXVI

EQUIPMENT UTILIZATION FOR QUERY HANDLING

EQUIPMENT	PROCESS	INTERFACE	FREQUENCY	HOURS/MO.	REMARKS
Input/Output Consoles	3.2.2.2 3.2.5.4	32-9 32-54	500/day divided as follows:		
			125/day	41.6	1 min./query
			250/day	334.0	4 min./query
			125/day	625.0	15 min./query

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TABLE XXVII

FILE REQUIREMENTS FOR QUERY HANDLING

FILE	PROCESS	AVERAGE ACCESSES/DAY
COINS LOG	3.2.3.7	1000.
INDEX RECORD FILE	3.2.4.3 3.2.4.11	3000.
HEADER SECTOR OF IDF (UARO)	3.2.4.3 3.2.4.11	3000.
UNIT RECORDS (UR)	3.2.4.5 3.2.4.13	2500.
UNIQUE TERM INDEXES (IX)	3.2.4.9 3.2.4.17 3.2.4.21 3.2.4.27 3.2.4.33	2250.
BROAD TERM INDEXES (IX)	3.2.4.9 3.2.4.17 3.2.4.21 3.2.4.27 3.2.4.33	750.
LIST OF INDEX RECORDS (LIR)	3.2.4.23 3.2.4.29 3.2.4.35	750.
LIST OF MACHINE REFERENCE NUMBERS	3.2.4.25 3.2.4.37. 3.2.4.31	750.
RANGE OF ARGUMENTS PLUS FUNCTIONS	3.2.4.20	150.

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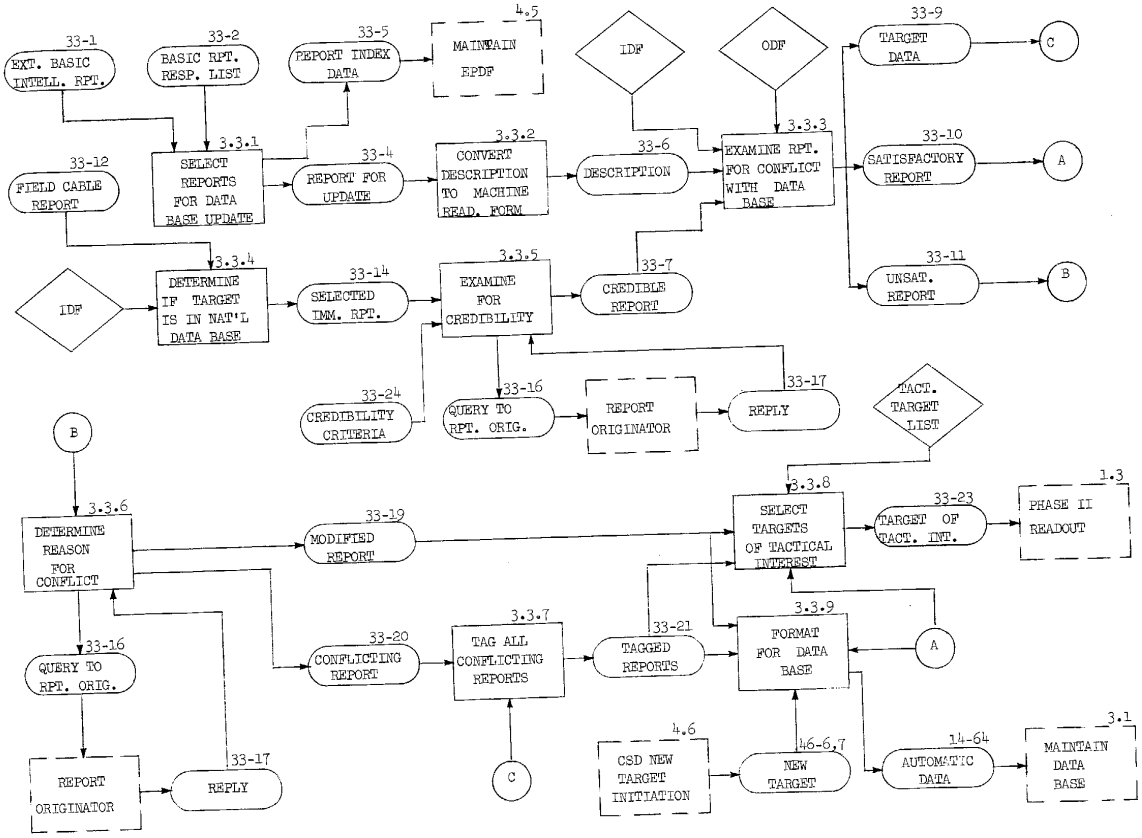

Figure 80 3.3 Processing of Field Reports

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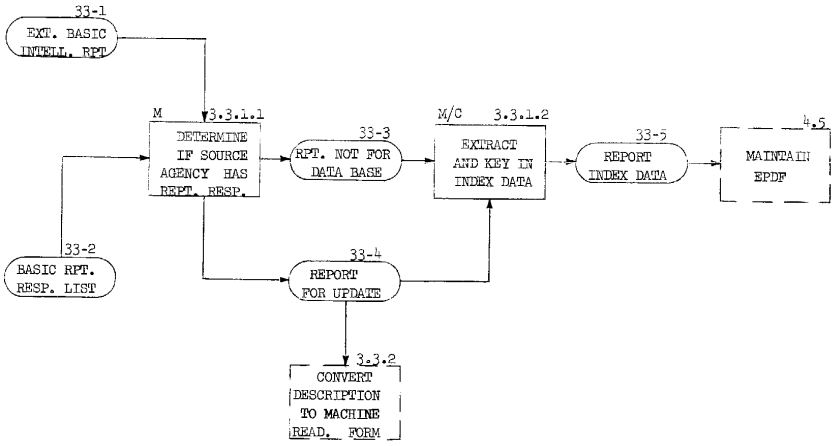

Figure 81 3.3.1 Select Reports for Data Base Update

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Figure 82 3.3.2 Convert Description to Machine Readable Form

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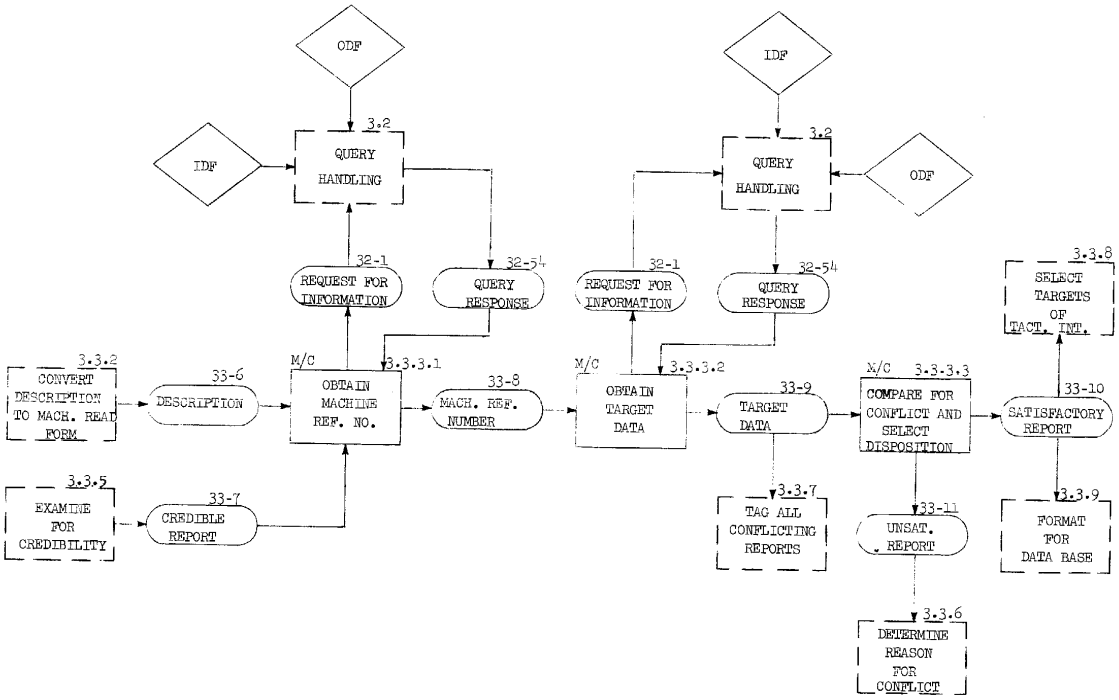

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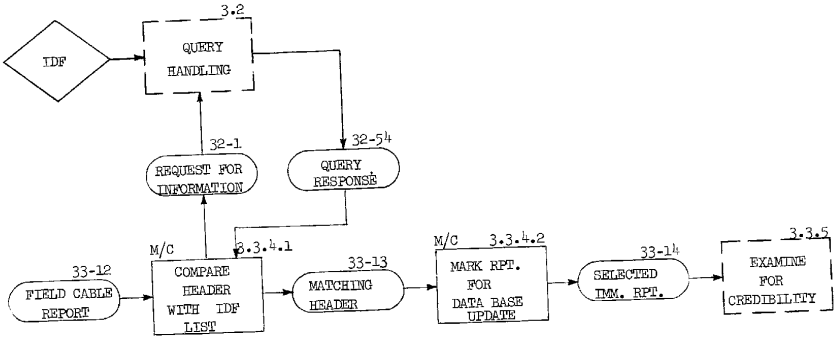

Figure 84 3.3.4 Determine if Target is in National Data Base

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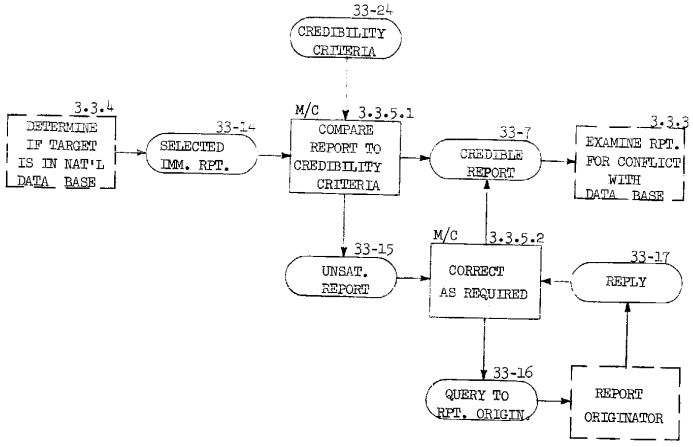

Figure 85 3.3.5 Examine for Credibility

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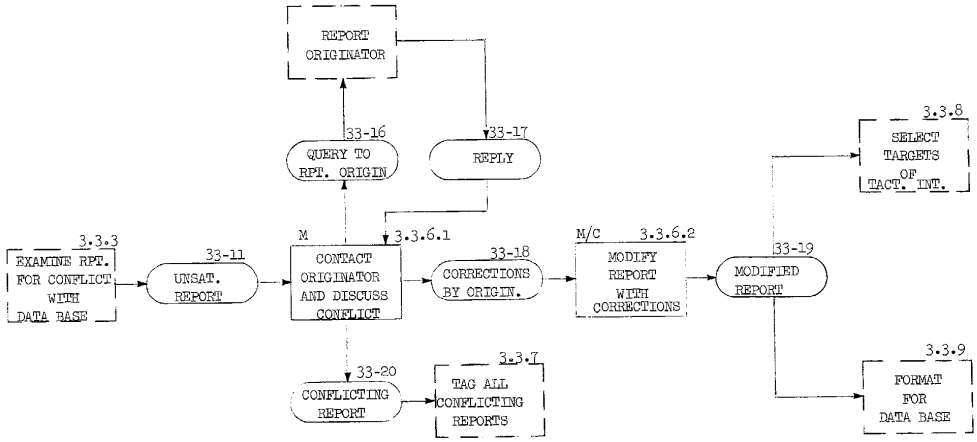

Figure 86 3.3.6 Determine Reason for Conflict

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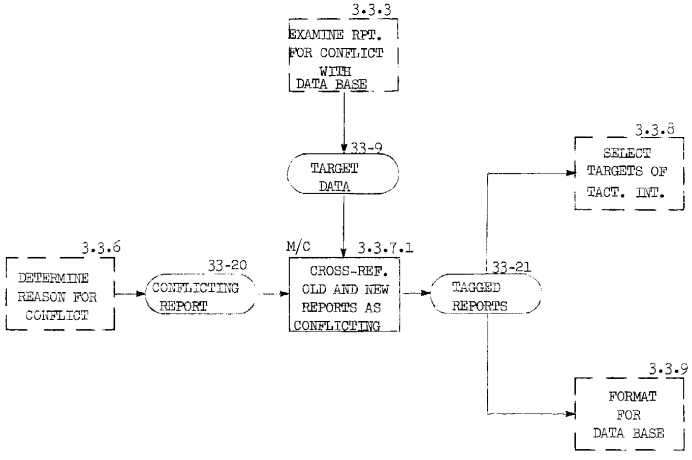

Figure 87 3.3.7 Tag All Conflicting Reports

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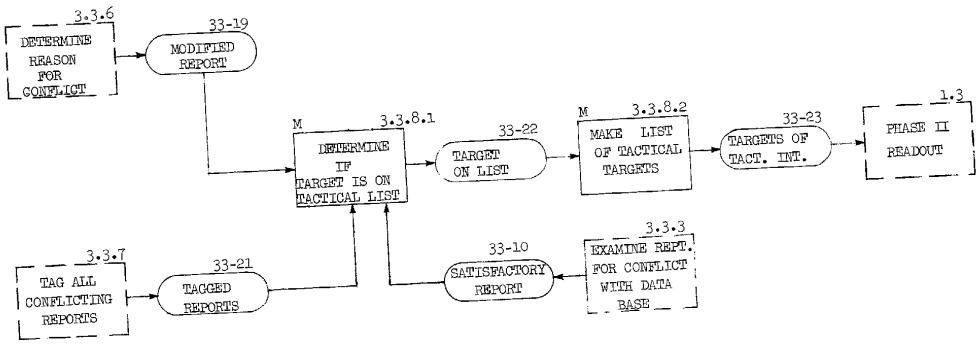

Figure 88 3.3.8 Select Targets of Tactical Interest

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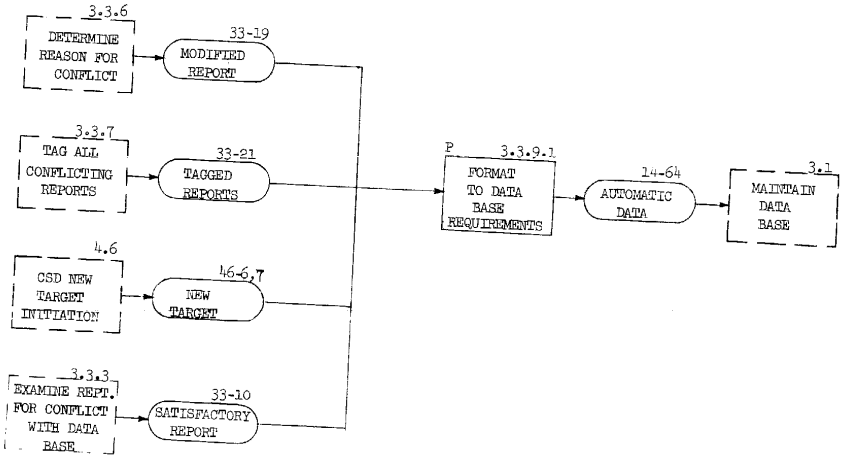

Figure 89 3.3.9 Format for Data Base

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agencies other than NPIC.

The inputs to this activity may be cables which arrive in machine readable form or hard copy Basic Intelligence Reports. Once the hard copy reports (or the appropriate sections of them) are converted to machine readable form, both types of inputs are treated in essentially the same fashion.

The reports are examined for credibility (principally to detect communications errors in cables) and corrected after a telephone conference with the originator if necessary. The report is then tested for conflict with data already in the files by calling up the necessary parts of the IDF on a display and making a visual comparison. Conflicts, if they exist, result in further conversation with the report originator. If they cannot be resolved, both the new report and the one with which it conflicts are tagged with a cross-reference and returned to the data base. Non-conflicting reports can, of course, be entered immediately.

As a by-product of this activity, new index records for the hard copy reports are generated and sent to the Exploitation Products Data File. Also as a part of this activity, targets of tactical interest which are to be given a more careful Phase II readout at NPIC are selected, and notification is sent to PAG so that readout can be scheduled. The final formatting and data base entry functions of this activity serve as a means for entering new targets initiated by CSD into the files.

3.3.3.2 Equipment Utilization

Processing of Field Reports involve extensive use of an Input/Output Console with editing capabilities. Table XXVIII shows the processes which use these devices and the time on each device required.

3.3.3.3 File Requirements

Table XXIX shows the files and average daily access rates required for this activity.

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TABLE XXVIII

EQUIPMENT UTILIZATION IN THE PROCESSING OF FIELD REPORTS

EQUIPMENT	PROCESS INTERFACE		FREQUENCY	HOURS/MO.	REMARKS
Input/Output Console with Edit Capability	3.3.1.2	33-5	1/report	23.2	Based on 700 reports/mo. 1 min./report
	3.3.2.1	33-6	1/report	12.5	250 reports with descriptions
Query Consoles	3.3.3.1	32-1 32-54	1/report		700 reports
	3.3.3.2	33-9 32-1 32-54	1/report	46.5	4 min./each query
	3.3.3.3	33-10	30% reports		
	3.3.4.1	33-13 32-1 32-54	10% reports " "	21.0	4 min./query
	3.3.4.2 3.3.5.1	33-14 33-7	" 15% reports		
	3.3.5.2 3.3.6.2	33-17 33-19	15% reports 15% reports	3.5	1 min./entry
	3.3.7.1	33-21	15% reports	3.5	1 min./entry
	3.3.8.1	32-1 32-54 33-22	60/month	1.0	1 min./entry

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TABLE XXIX

FILE REQUIREMENTS FOR PROCESSING OF FIELD REPORTS

FILE	PROCESS	AVERAGE ACCESSES/DAY
IDF	3.3.4.1	30.
ODF	3.3.3.2	60.
TACTICAL TARGET LIST	3.3.8.1	30.

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3.4 Supplementary Activities

3.4.1 Film Distribution

3.4.1.1 Activity Description

This activity is performed in support of mission readout. Only predictable mission film coverage can be assigned to specific teams prior to receipt of film cans at the Center. This activity is, therefore, limited to predictable mission film. The flow of information through this activity is shown in Figures 90 through 94.

There are two required inputs to the Film Distribution Activity. One is notification from the film processing laboratory that film is enroute; but more specifically notification of the total number of cans of film, the number of cans per pass, and the actual frames in each can. The other input is, of course, the film itself. The functions to be performed on these two inputs are to assign and affix film can registry numbers, which are used both for security purposes and assignment procedures, and to distribute the film cans according to predicted film coverage lists. The resulting output of this activity is a Film Location File, which contains the registry numbers used for security purposes, and baskets of film cans for specific PI teams. To accomplish the film can distribution it is assumed that the assigned film can registry numbers have been incorporated in the Pre-Readout Activity (see Section 3.1.1) which produces team distribution lists for Phase I and Phase II Readout.

3.4.1.2 Equipment Utilization

Automatic maintenance of records during the Film Distribution activity requires that the film library have a means to enter data and retrieve data from the Film Location File. Since this procedure is a matter of updating a highly structured file and does not require manipulation of large quantities of data, a simple Teletype send/receive unit is adequate. The utilization of this device is shown in Table XXX.

3.4.1.3 File Requirements

Table XXXI shows the files and average daily access rates required for this activity.

3.4.2 Film Library Maintenance

3.4.2.1 Activity Description

The information flow through this activity is shown in Figures 95 through 98. Maintenance of the film library in the IIS is limited to

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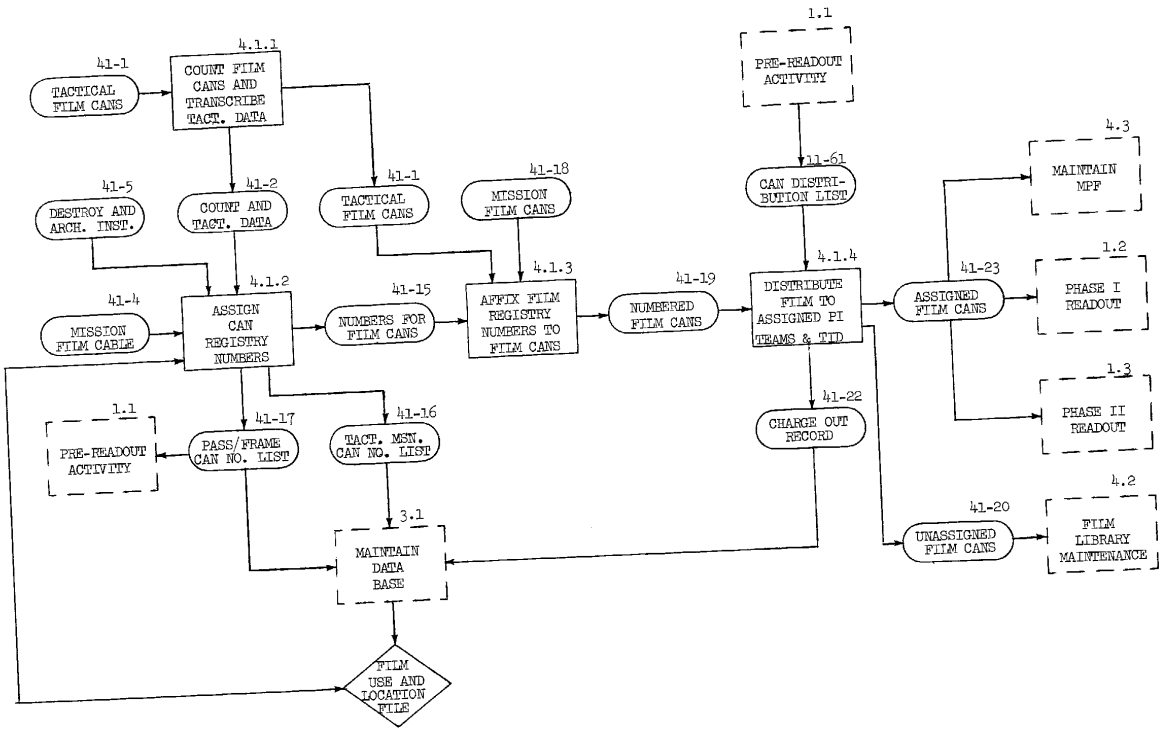

Figure 90 4.1 Film Distribution

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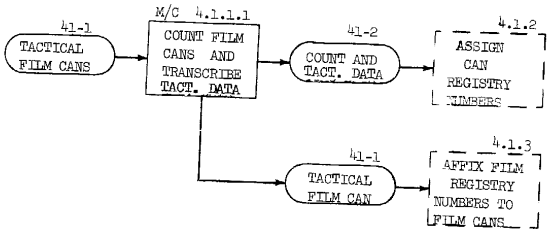

Figure 91 4.1.1 Count Film Cans and Transcribe Tactical Data

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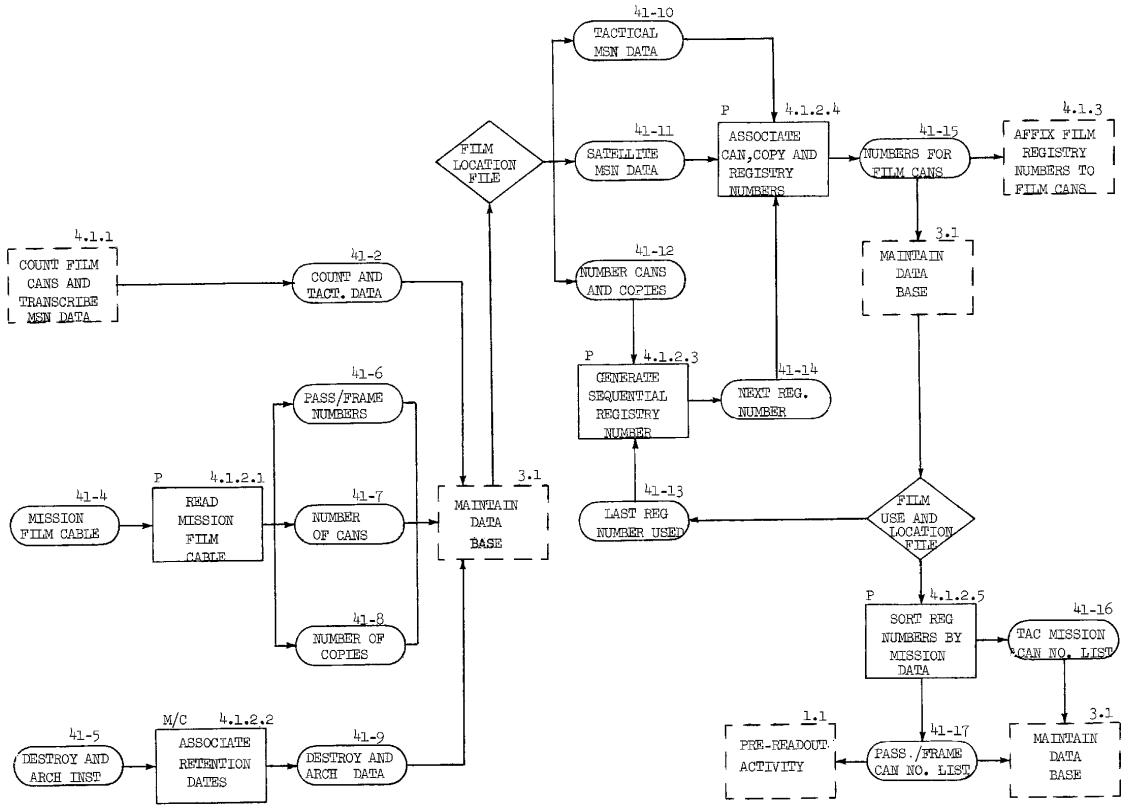

Figure 92 4.1.2 Assign Can Registry Numbers

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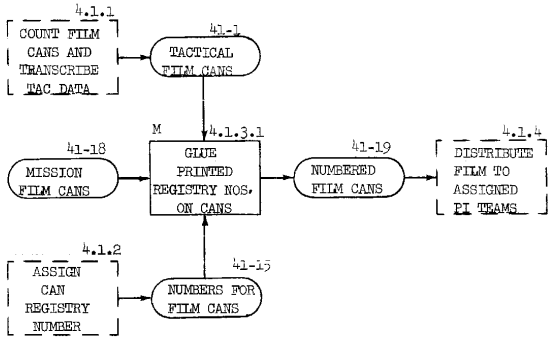

Figure 93 4.1.3 Affix Film Registry Numbers to Film Cans

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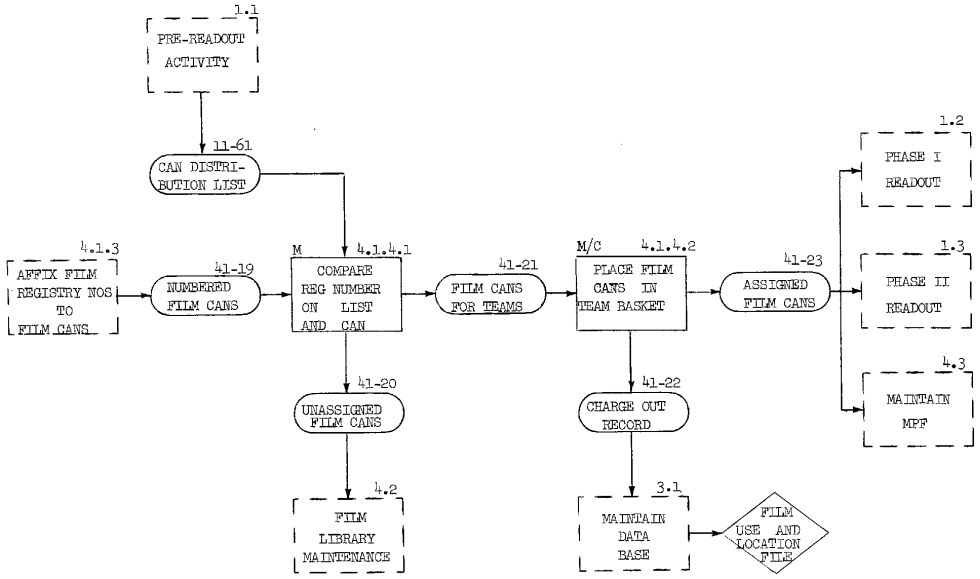

Figure 94 4.1.4 Distribute Film to Assigned PI Teams and TID

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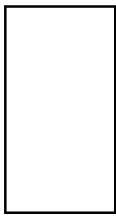

TABLE XXX

EQUIPMENT UTILIZATION DURING FILM DISTRIBUTION

EQUIPMENT	PROCESS	INTERFACE	FREQUENCY	HOURS/MO.	REMARKS
Teletype Send-Receive Unit	4.1.1.1	41-2	700-1200/mo.	13.3	1 min./entry
	4.1.1.2	41-9			Occurs infrequently. On monthly basis, actual use is negligible.
	4.1.4.2	41-22	1000-1850/mo.	50.0	2 min./entry

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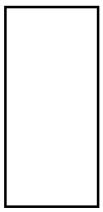

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TABLE XXXI

FILE REQUIREMENTS FOR FILM DISTRIBUTION

FILE	PROCESS	AVERAGE ACCESSES/DAY
FILM USE AND LOCATION FILE	4.1.2.1 4.1.2.2	1.0
	4.1.2.4	0.4
	4.1.2.3 4.1.2.5	100.0

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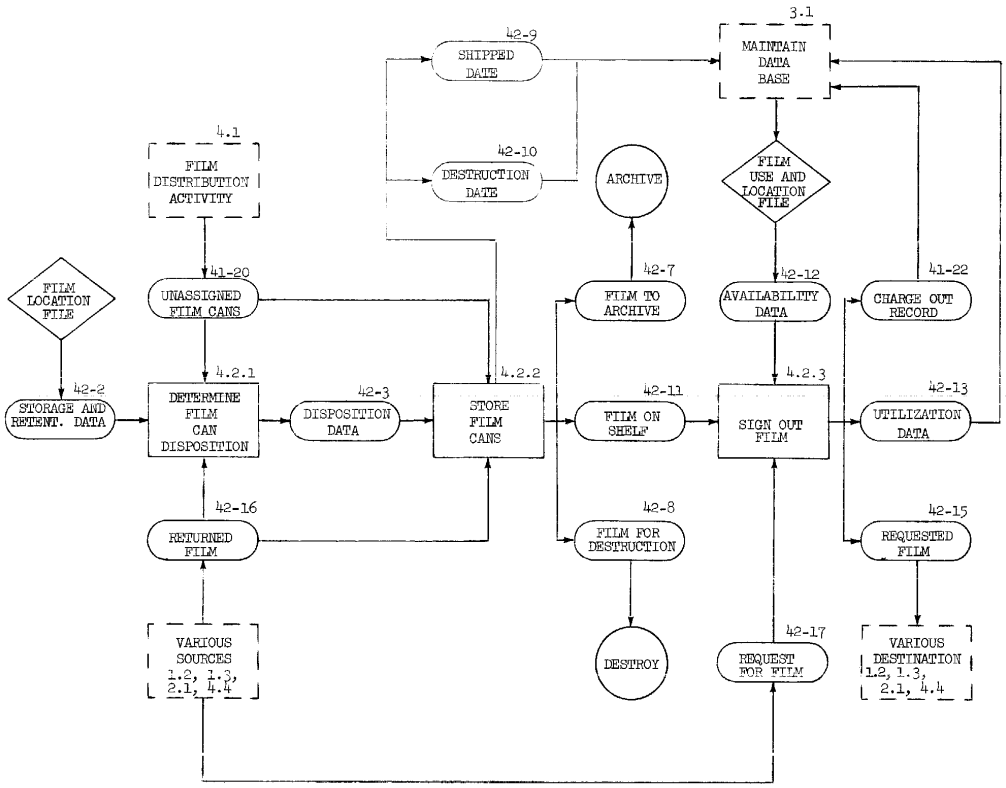

Figure 95 4.2 Film Library Maintenance

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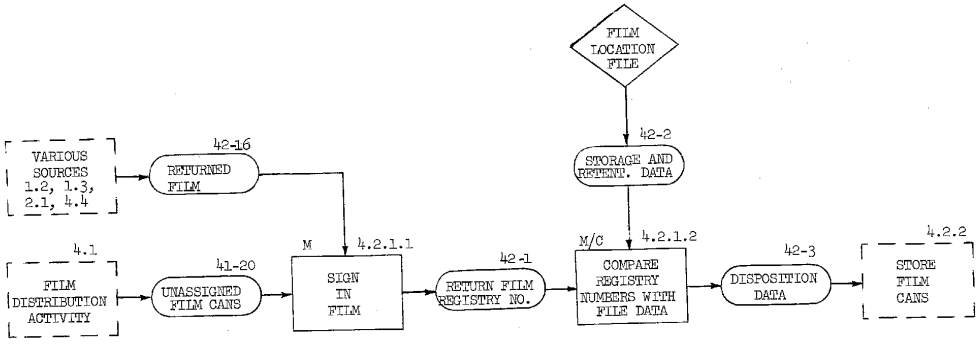

Figure 96 4.2.1 Determine Film Can Disposition

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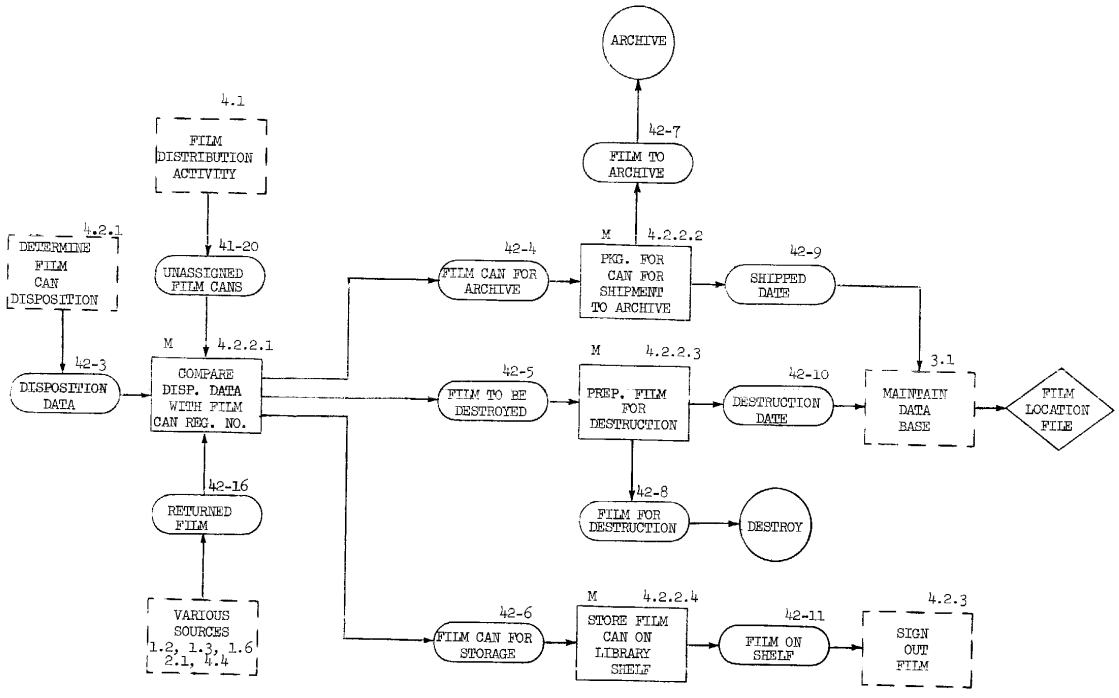

Figure 97 4.2.2 Store Film Cans

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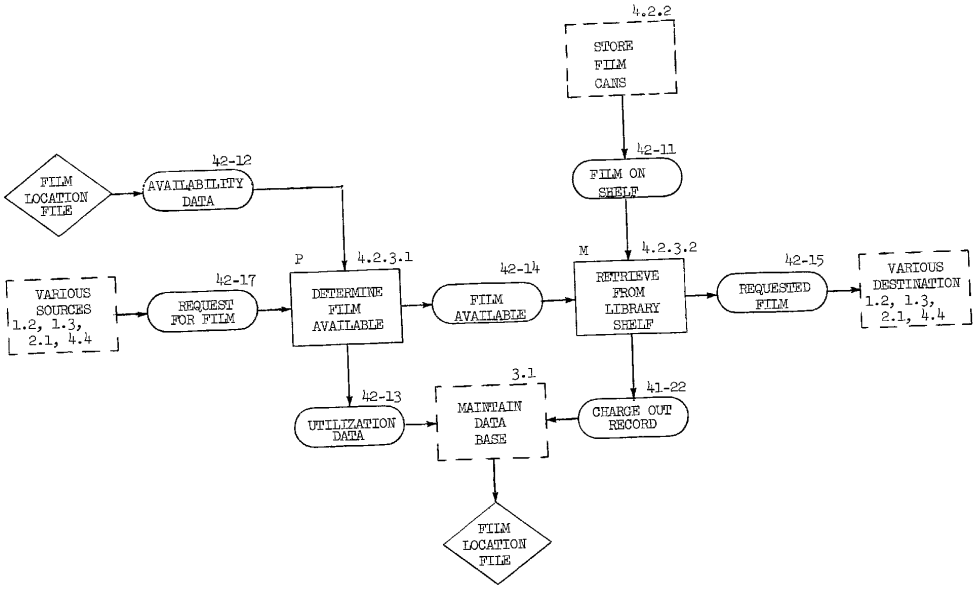

Figure 98 4.2.3 Sign Out Film

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mission film, both satellite and aircraft, which is normally stored in cans with registry numbers.

Inputs to the activity include those film cans not assigned to PI teams during Phase I and Phase II Readout and the film which is returned to the Film Library after use by the various components within the Center. Additionally, the activity handles requests for specific film identified by mission number, pass number and frame number.

In addition to supplying film in response to requests, the activity determines the disposition of returned film, placing it in the proper storage bins. Periodically, the Film Location File, which maintains a record of all transactions in the Film Library, is examined and film cans which are to be destroyed or sent to the film archives are identified and proper disposition is made.

3.4.2.2 Equipment Utilization

The Film Library Maintenance activity involves many of the same procedures as Film Distribution and will utilize the same Teletype Send/Receive devices since the same files are being queried and modified. Table XXXII shows the utilization of this equipment for the Film Library Maintenance.

3.4.2.3 File Requirements

Table XXXIII shows the files and average daily access rates required for this activity.

3.4.3 Maintain Mensuration Parameters File (MPF)

3.4.3.1 Activity Description

This activity (Figures 99 through 101) provides the capability to maintain an up-to-date MPF in the IIS format. The activity must first process the mission data received via DLT's to convert it to a form acceptable for use by both humans and the Real-Time Mensuration Program (RTMP). The completed data is then structured for addition to the MPF. The implementation of this activity will depend on the successful implementation of the Attitude and Position Catalog Generation System (APC), Phase I as outlined in the NPIC specification, dated 3 April 1967 (TCS-3986/67)/ Phase II of the APC will require modification to change from the TIPS format to the IIS MPF format.

Reduced stellar data is introduced into this file as it becomes available by means of the Data Base Maintenance procedure.

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TABLE XXXII

EQUIPMENT UTILIZATION DURING FILM LIBRARY MAINTENANCE

EQUIPMENT	PROCESS	INTERFACE	FREQUENCY cans/mo.	HOURS/MO.	REMARKS
Teletype Send-Receive Device	4.2.2.2	42-9	410-720	1.0	6 sec./entry
	4.2.2.3	42-10	130-240	0.3	6 sec./entry
	4.2.1.1	42-1	1150-2060	60.0	2 min./entry
	4.2.1.2	42-3	1150-2060	6.0	12 sec./entry
	4.2.1.3 4.2.3.2	42-14 41-22	300	5.0	1 min./entry. (This is an update of the record as opposed to the creation of the record in 4.1.4.2)

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TABLE XXXIII

FILE REQUIREMENTS FOR FILM LIBRARY MAINTENANCE

FILE	PROCESS	AVERAGE ACCESSES/DAY
FILM USE AND LOCATION FILE	4.2.1.2	100.4
	4.2.3.1	200.0
	4.2.3.2	100.0

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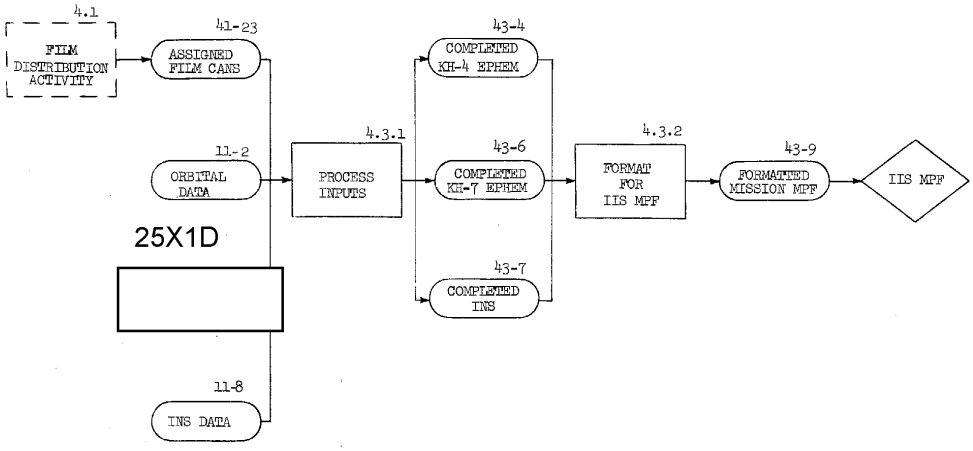

Figure 99 4.3 Maintenance of the MPF

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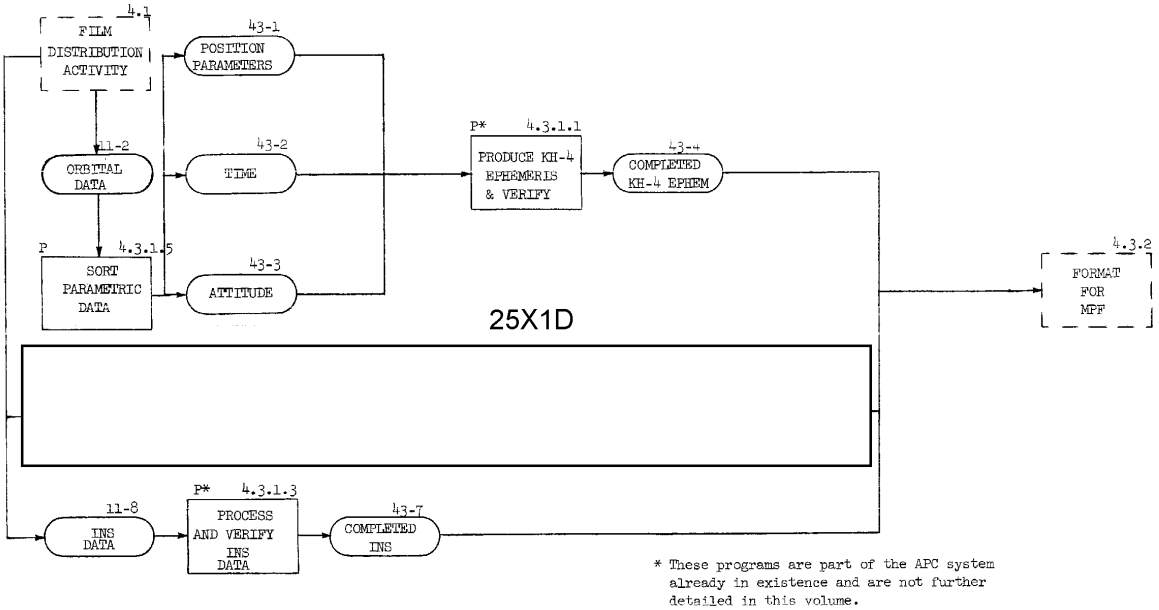

* These programs are part of the APC system already in existence and are not further detailed in this volume.

Figure 100 4.3.1 Process Inputs

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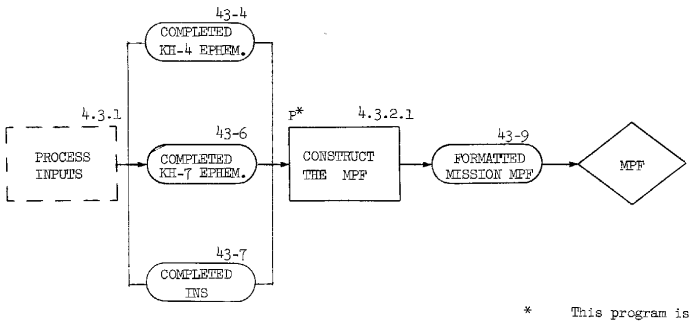

* This program is part of the APC system already in existence.

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Figure 101 4.3.2 Format for MPF

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3.4.3.2 Equipment Utilization

Maintenance of the Mensuration Parameters File requires no special equipment outside the central computer complex where approximately one hour of card reader time per month is required to process KH-4 input data.

3.4.3.3 File Requirements

Table XXXIV shows the files and average daily access rates required for this activity.

3.4.4 Provide Mensuration Assistance

3.4.4.1 Activity Description

Mensuration support is provided to the Center principally by TID with the necessary computations being made by IPD. The same type of computational support for mensuration is also provided to the detachments (e.g. IAS, DIAAP, etc.).

Inputs to the computer may be either electronic signals from on-line comparators or may be punched cards, automatically produced by the comparator, which are later batch-processed on the computer.

Outputs are listings of point coordinates, azimuths and distances between selected sets of points, and areas bounded by sets of points and (if required) scale drawings automatically plotted from computer output.

The flow of information in this activity is shown in Figures 102 through 107. Requests for mensuration may be initiated as a result of Phase I or Phase II Readout or as a result of a requirement for a detailed report. The request is processed to determine the film requirements and to identify and extract the necessary parameters from the MPF. As each point is measured on the comparator, the necessary identification and control data is entered manually. In the on-line mode, the necessary computations are made immediately; in the batch-processing system, the cards are collected and processed as a complete set. Programs for the Univac 494 to provide the necessary computations in either mode are already under development. Except for minor changes to accommodate system requirements, these programs will be used in the IIS. Both programs allow for plotted as well as tabular output.

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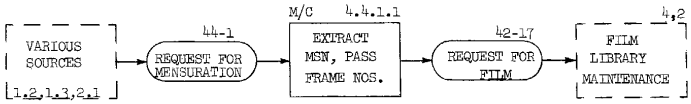

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Figure 103 4.4.1 Determine Film Requirements

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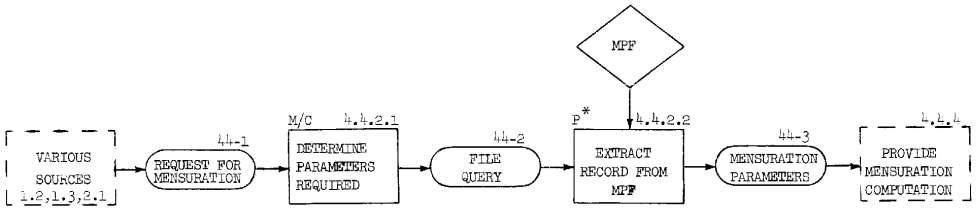

* This program is part of existing PTMS programs.

Figure 104 4.4.2 Extract Data from MPF

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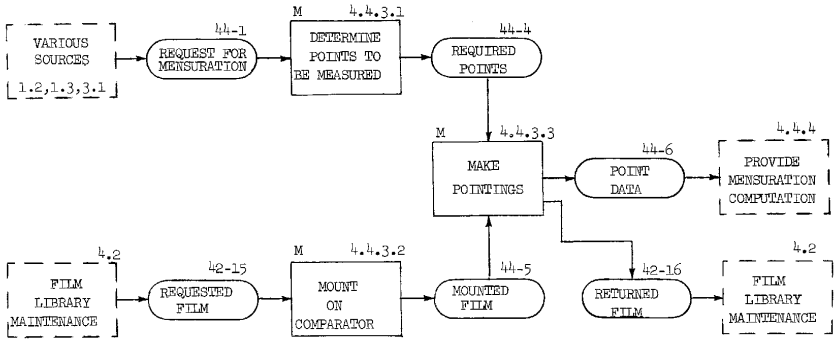

Figure 105 4.4.3 Measure Points

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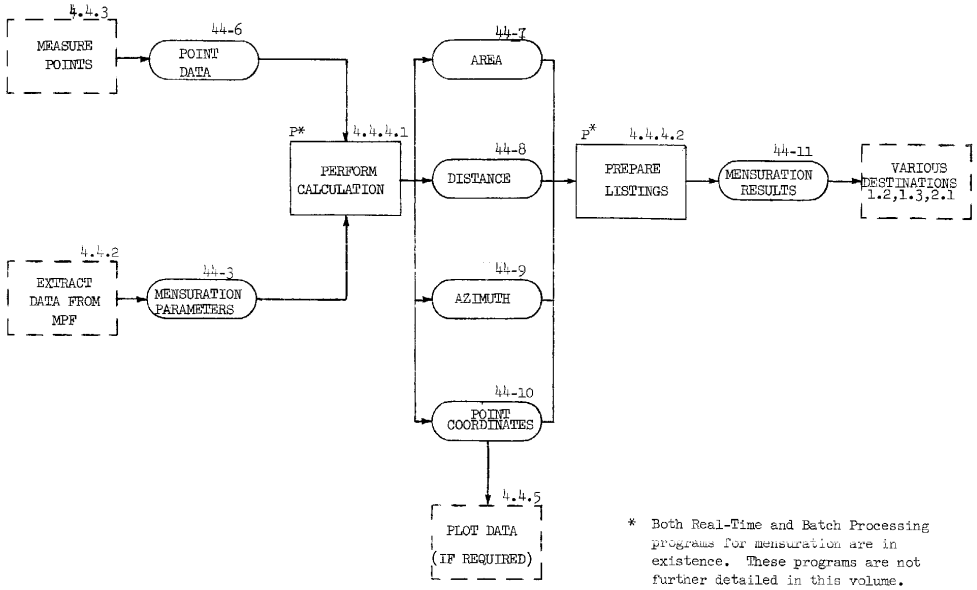

Figure 106 4.4.4 Provide Mensuration Computations

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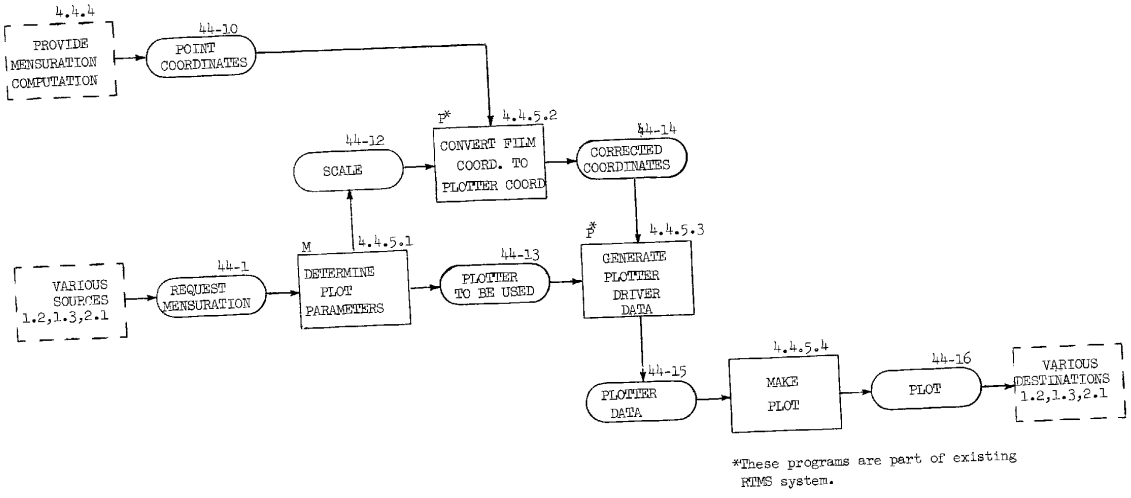

*These programs are part of existing RTMS system.

Figure 107 4.4.5 Plot Data (If Required)

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TABLE XXXV

EQUIPMENT UTILIZATION FOR MENSURATION ASSISTANCE

EQUIPMENT	PROCESS	INTERFACE	FREQUENCY	HOURS/MO.	REMARKS
Teletype Send-Receive Device (with automatic comparator)	4.4.2.1	42-2	1/mens. req.	600.0*	Required if data is not in on-line MPF.
	4.4.2.2	44-3			
	4.4.3.3	44-6	1/pointing		* Actual TTY time is approximately 60 hrs. for 39000 pointings. However console must be considered to be in use for entire mensuration cycle.
Plotters	4.4.5.4	44-16	as required	60.0**	** Estimated total for all plotters based on extrapolation of current use.

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information retrieval and entry attached to them. Plotter loads are estimated on the basis of current experience. It should be noted that these plotters are already in existence at NPIC. None is even approaching saturation. Therefore, no new additional equipment is contemplated.

3.4.4.3 File Requirements

Table XXXVI shows the files and average daily access rates required for this activity.

3.4.5 Exploitation Products Data File (EPDF)

3.4.5.1 Activity Description

Indexing data for exploitation products produced within the IIS, will at certain points in their development process, be in formatted machine readable form. The Status List, which contains target names, category codes, COMIREX numbers, geographic coordinates, country codes, etc. is a principal example of a machine readable list which can be used for the indexing of First Phase Reports and Supplements. This process is designed to automatically extract and order the appropriate indexing data and assign EPDF accession numbers to the exploitation products for input into the files. Indexing data for exploitation products received by the Center in hard copy or other machine readable form will be manually converted and formatted for entry into the data base in machine readable form.

A temporary file will maintain daily accessions for any period of time required and serve as a rapid access file of current reports. Periodically, the EPDF accumulates all reports and is the master repository for this data. This file may be sorted by any of several keys to generate an ordered file and to produce mats for index publications.

The flow of information through this activity is shown in Figure 108.

3.4.5.2 Equipment Utilization

Table XXXVII shows the processes requiring special equipment for maintenance of the Exploitation Products Data File. Such equipment is limited to an Input/Output device for the entry and verification of new material and a minor use of the computer printer to generate mats for the publication of hard copy listings of the index. Note that queries against this file have already been accounted for in other activities.

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TABLE XXXVI

FILE REQUIREMENTS FOR MENSURATION ASSISTANCE

FILE	PROCESS	AVERAGE ACCESSES/DAY
MENSURATION PARAMETERS FILE	4.4.2.2	25.

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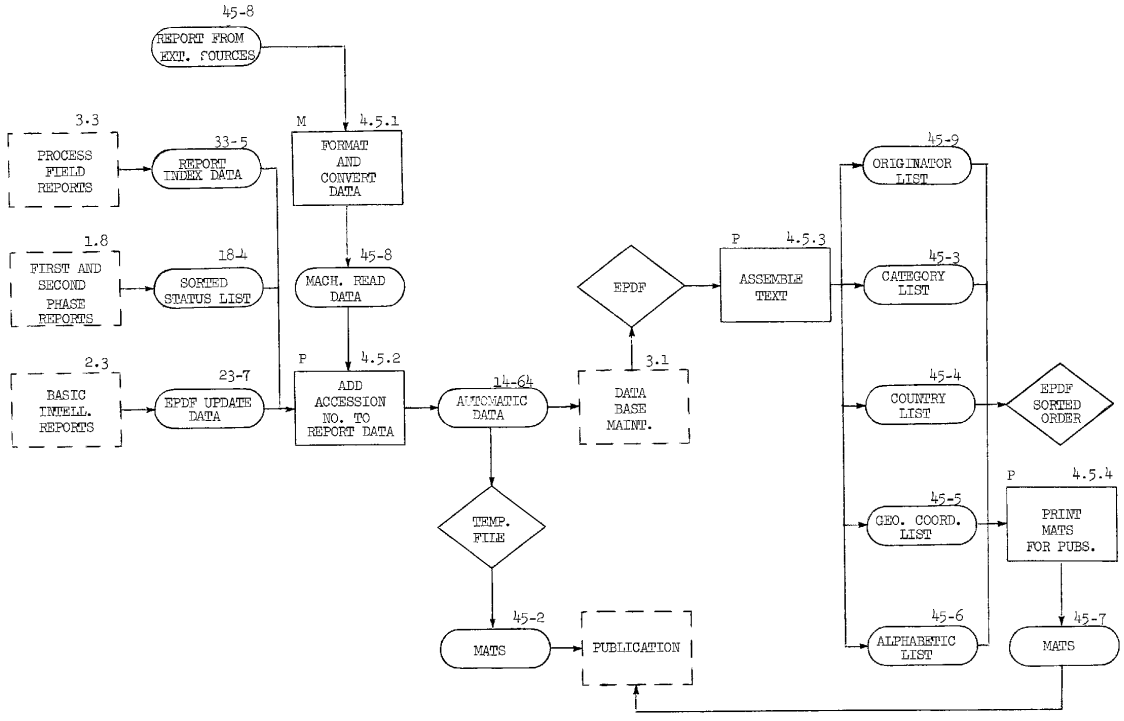

Figure 108 4.5 Exploitation Products Data File Generation

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TABLE XXXVII

EQUIPMENT UTILIZATION FOR MAINTENANCE OF THE EXPLOITATION PRODUCTS DATA FILE

EQUIPMENT	PROCESS	INTERFACE	FREQUENCY	HOURS/MO.	REMARKS
Input/Output Console	4.5.1*	45-8	900 entries/mo.	30.0	Assumes 300 character/entry and 60 wpm typing speed. Time is doubled to allow readback for verification.
High Speed Printer	4.5.2	45-2	1/month	0.1	Printing of monthly accessions. 900 lines listed in 3 different orders.
	4.5.4	45-7	1/3 month and 1/12 month	0.2	Quarterly and annual listings in three orders. In the months they occur, times actually amount to 0.3 hours and 1.2 hours respectively.

* In this activity there is only one function. Hence processes are identified as x.x.x.

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TABLE XXXVIII

FILE REQUIREMENTS FOR EXPLOITATION PRODUCTS DATA FILE GENERATION

FILE	PROCESS	AVERAGE ACCESSES/DAY
EPDF	4.5.3 *	0.1
TEMPORARY FILE	4.5.2 *	132.0

*This is a one function activity Hence processes are identified by only 3 digits.

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3.4.6 CSD New Target Initiation

3.4.6.1 Activity Description

Approximately 320 new targets, on an average, are added to the data base each month. A little less than half of these are initiated during Phase I and/or Phase II readout activities. The remainder are initiated as a result of external requests or CSD review of incoming collateral data.

Figures 109 through 114 illustrate the information flow in the activity. New Target Forms (NTF's) which are originated in PI readout and sent to CSD, are subjected to an initial check against the headers in the Installations Data File to insure accuracy of any "deleted" header which may have been obtained and entered on the form by the PI. If accurate, CSD will reactivate the "deleted" target file in the IDF. The file is then employed to add a report of change which supports the reactivation of the target. The PI NTF, at this point, is complete for output reporting purposes, and copies are forwarded to the Data Entry and Approval activity (Section 3.1.4).

If a "deleted" header is not available, a header is generated and the PI NTF is forwarded without other changes. In either case, coordination is effected by CSD to insure acceptance as a new target. The NTF may be discarded at any point if the PI report is considered inconsequential or is found to refer to an active IDF installation.

New Target Forms which originate in CSD contain a generated header (if a "deleted" header is not appropriate) and a description based on available collateral information or a "deleted" target file. These are coordinated to insure acceptance.

The verified New Target Forms, either PI or CSD originated, are then employed in a process to initiate a new target in the IDF. Readout requirements, new or significant collateral data, and source data and map references are prepared for file input. For the PI originated NTF's, these data are submitted on a separate form, since the PI entries have already been approved and converted to machine readable form for reporting purposes. For the CSD originated NTF's, these data are merely added to the form. Both products are forwarded to Process Field Reports (Section 3.3.3) for entry into the IDF.

3.4.6.2 Equipment Utilization

During the New Target Initiation Activity, an Input/Output console (which may also be used to query the data base) is the principal special equipment required. Table XXXIX shows the processes within this activity which will use this device and the expected utilization for each process.

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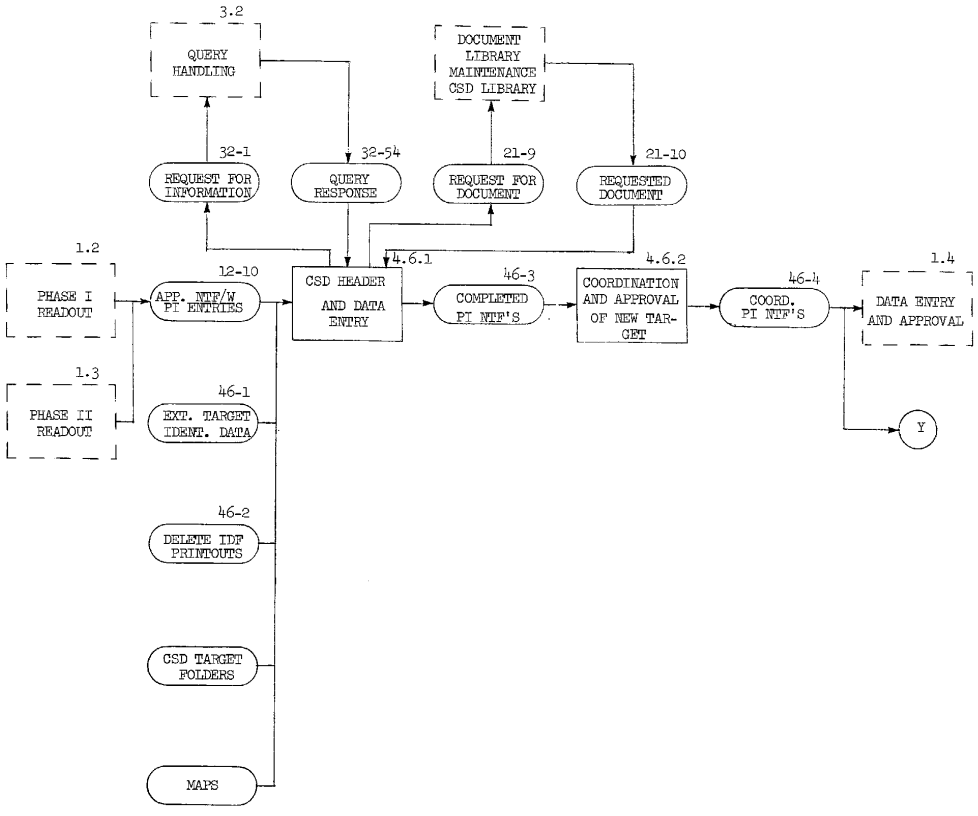

Figure 109 4.6 CSD New Target Initiation

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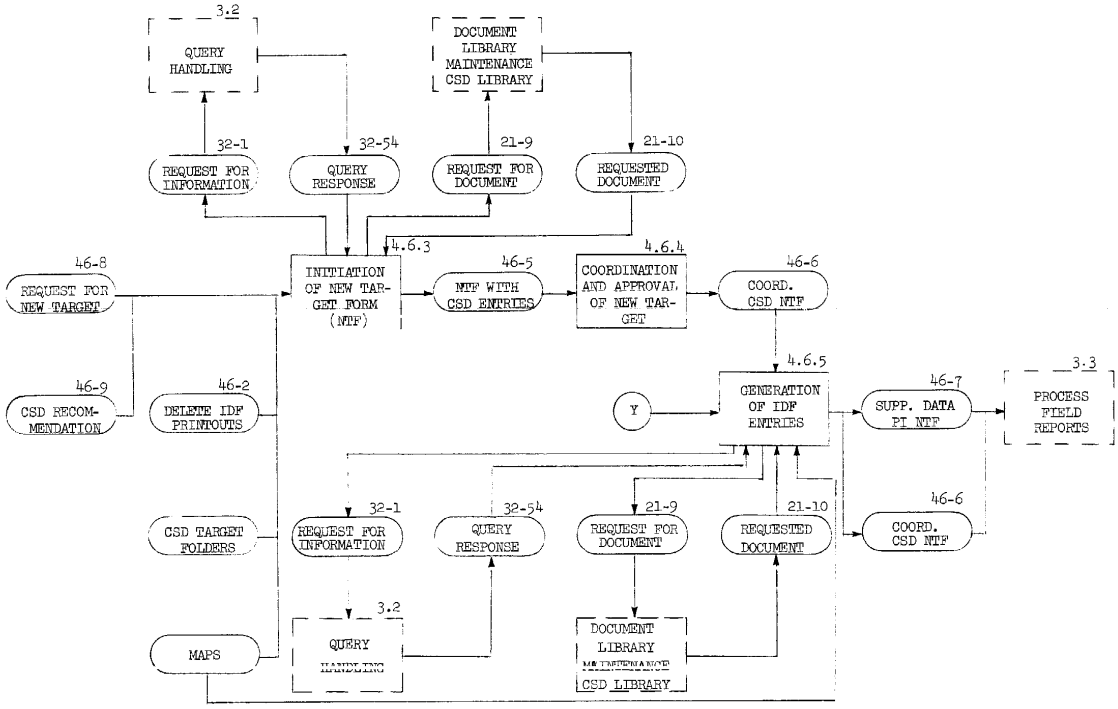

Figure 109 (cont'd) 4.6 CSD New Target Initiation

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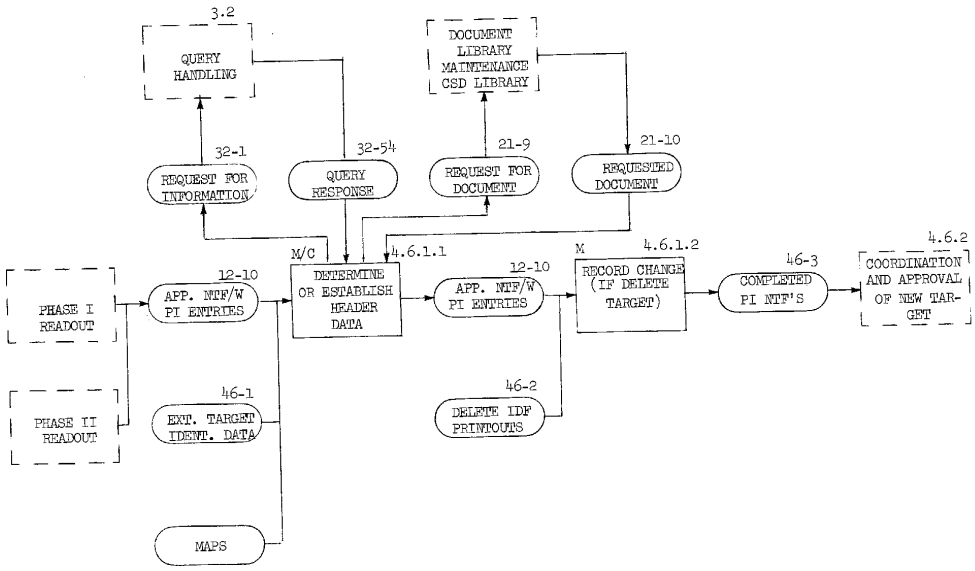

Figure 110 4.6.1 CSD Header and Data Entry

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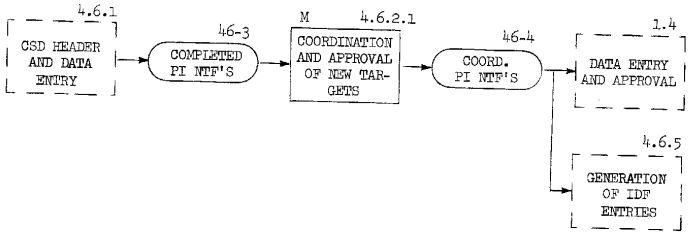

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Figure 111 4.6.2 Coordination and Approval of New Targets (PI Originated)

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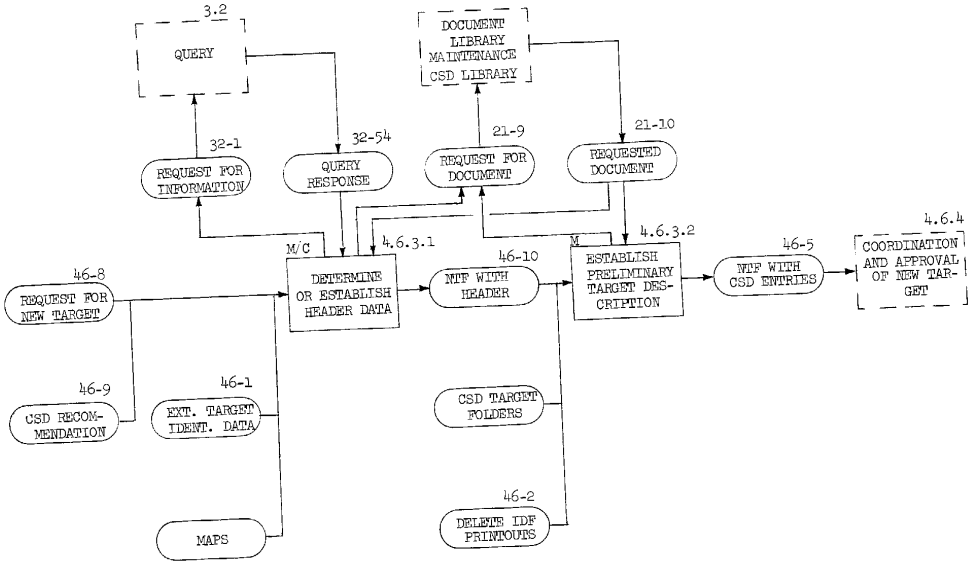

Figure 112 4.6.3 Initiation of New Target Form (CSD)

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Figure 113 4.6.4 Coordination and Approval of New Targets (OSD Originated)

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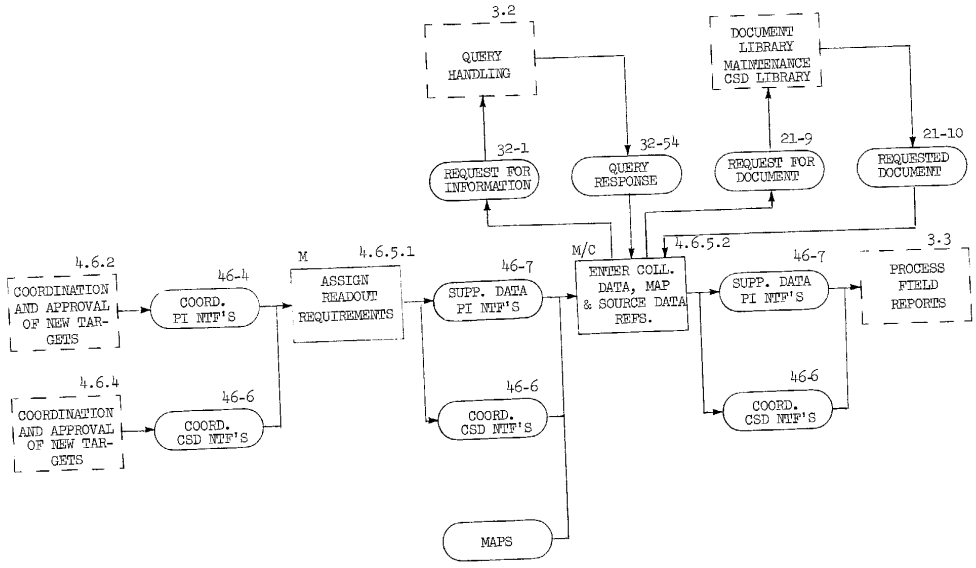

Figure 114 4.6.5 Generation of IDF Entries

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TABLE XXXIX

EQUIPMENT UTILIZATION DURING CSD NEW TARGET INITIATION

EQUIPMENT	PROCESS	INTERFACE	FREQUENCY	HOURS/MO.	REMARKS
Input/Output Console	4.6.1.1	32-1 32-54 21-9	330 new tgt./ month for both processes	11.0	2 min./target
	4.6.3.1	32-1 32-54 21-9			
	4.6.3.2	21-9	330 tgts./mo.	11.0	2 min./target
	4.6.5.2	32-1 32-54 21-9	330 tgts./mo.	22.0	4 min./target (includes readback for verification of correct entry)

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3.4.6.3 File Requirements

All file accesses for this activity have been included in the totals shown in Section 3.3.2.3 and hence are not duplicated here.

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4. INTERNAL INTERFACES

In Section 2 of this volume, we described the interfaces of the IIS with the rest of the intelligence community. In this section we shall deal with the internal interfaces which link the various activities and functions of the system.

Two of these internal interfaces, the PI Presentation and the PI Worksheet are innovations peculiar to the IIS and are sufficiently complex to warrant detailed description. These are covered in Section 4.1.

The remaining interfaces are described on standard forms showing their source and destination, their form, the frequency with which they are generated, the volume of information they contain and the content and organization of this information. Each form also contains a reference number corresponding to those shown on the appropriate activity or function diagram(s). For the sake of completeness, data about the system inputs and outputs and the PI Presentation and Worksheet are also recorded on these forms with the appropriate descriptive paragraph referenced under "Content and Organization". To assist in their use, these forms are bound separately.

4.1 Major Interfaces

4.1.1 PI Presentation

The PI Presentation was conceived as a technique for presenting to the photo interpreter the essential portions of the Installations Data File necessary for Phase I and Phase II Readout. It is generated as a function of Pre-readout Activities (see Section 3.1.1 of this volume) and serves as an input to Phase I Readout (Section 3.1.2) and Phase II Readout (Section 3.1.3). It is also generated on request through the Query Handling Activity (Section 3.3.2) in support of Basic Intelligence Readout (Section 3.2.1).

Generation of the PI Presentation is a computer process in which portions (sectors) of the necessary Target Unit Records are extracted from the IDF, formatted as shown in Figure 115 and listed on a computer printer. It should be noted that, for Phase I Readout, the order of listing is by PI Team by priority of readout; for Phase II Readout, the order is by Pass, Frame, Film Coordinates. It should also be noted that for Phase II Readout, only the Header and Mission and Film Data are listed for targets previously presented for Phase I Readout and for targets on the "Delete Target" list. Inclusion of this information is intended to avoid erroneous identification of a visible target as "new" and to generally assist in mission indexing.

Data volumes for the PI Presentation vary widely depending upon the importance of, interest in, and activity at, the target. The presentation

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```
          MACHINE REFERENCE NUMBER -----
1*        HEADER: ----------------------------------------------------------------------------------
2         MISSION AND FILM DATA
                MISSION: ---------------------------------------------------------------------------
                FILM/TARGET PREDICTION -------------------------------------------------------------

3         NEW OR SIGNIFICANT COLLATERAL DATA
31001           ----------------------------------------------------------------------------------
31002           ----------------------------------------------------------------------------------
4         READOUT REQUIREMENTS
                ----------------------------------------------------------------------------------
                ----------------------------------------------------------------------------------

5         DESCRIPTION OF FIXED FACILITIES
                BASIC DESCRIPTION
                (ORIGIN, PHASE OF READOUT, DATE)          (PHOTO REF. OR REF. TO BASIC REPORT)
51001           ----------------------------------------------------------------------------------
51002           ----------------------------------------------------------------------------------
51003           ----------------------------------------------------------------------------------
51004           ----------------------------------------------------------------------------------
52001           ---      ---      ---      ---          (SELECTED FIXED FACILITIES IN FIXED FORMAT)
52002           ---      ---      ---      ---
52003           ---      ---      ---      ---
                CHANGES AND NEW REPORTS
                (ORIGIN, PHASE OF READOUT, DATE)          (PHOTO REF.)
53001           ----------------------------------------------------------------------------------
53002           ----------------------------------------------------------------------------------
53003           ----------------------------------------------------------------------------------
                (ORIGIN, PHASE OF READOUT, DATE)          (PHOTO REF.)
53004           ----------------------------------------------------------------------------------
53005           ----------------------------------------------------------------------------------

6         PI NOTES
61001           ----------------------------------------------------------------------------------
61002           ----------------------------------------------------------------------------------

7         LATEST BRIEFING BOARD
                MISSION: ---------------------------------------------------------------------------
                SIGNIFICANCE: ----------------------------------------------------------------------
                ----------------------------------------------------------------------------------
                ----------------------------------------------------------------------------------

8         OB AND MOBILE EQUIPMENT READOUTS
                MISSION: ---      ---      ---          MISSION: ---      ---      ---
                NOMENCLATURE   NO.   REMARKS            NOMENCLATURE   NO.   REMARKS
                ------------   ---   -------            ------------   ---   -------
                ------------   ---   -------            ------------   ---   -------

9         RECENT PHOTO COVERAGE ( LAST 5 REFERENCES )
                ---      ---      ---      ---      ---
                ---      ---      ---      ---      ---

0         MAP REFERENCES                                  * ENTRY NO.
                ----------------------------------------  ** LINE NO. ( GENERATED
                                                             EACH TIME PRESENTATION
                                                             IS PRODUCED)
```

Figure 115 PI Presentation

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for some targets may be as large as four or five 11"x14" sheets of computer output while others may be less than a full page. The average, however, is less than two pages.

Each presentation is identified by a computer generated machine reference number and contains the following:

1. Header, consisting of the target name, country, coordinates, BE number, NPIC number, COMIREX number, category code, and any other data deemed necessary to support target identification, retrieval of data not included in the presentation and reference to maps.

2. Mission and Film Data, mission identification and a film/target prediction including the pass, frame, and film coordinates of the target to assist in identification on the film.

3. New or Significant Collateral Data, including any data derived from a CSD review of incoming collateral data which is deemed of significance in the next readout of a particular target. This information is intended to support readout and direct the attention of the PI to particular items during readout.

4. Readout Requirements, including standing COMIREX and NPIC requirements to remind the PI of data to be entered on the worksheet.

5. Description of Fixed Facilities, consisting of the following:

   a. A brief description, in most cases, to the level of detail which has been adopted for the target. For those targets for which production of Third Phase Basic Reports is required, the description in the latest Basic Report will be used, or an abstract if such is included in the Basic Report. Normally, in the latter case, the abstract will be employed in providing data for First and Second Phase reporting; the detailed description will be available on request. The initial entry in the description will be either a mission and film reference for the last photography on which the description was validated or updated or a reference to the Basic Report, as appropriate. This description

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is provided for use in determining change at relatively simple targets, for review and acceptance where a description is an immediate readout requirement (in lieu of writing out a new description), and for reference in describing change (to insure that the location of the change is referenced to something which has previously been reported).

b. A listing of readouts, subsequent to the date of the description, each with an initial entry giving source, Phase of readout, date of readout, and mission and film reference. Changes, noted on readouts made by other photo interpretation units, which are reported to the national target data file subsequent to the date of the description will be entered in chronological sequence with other NPIC reports. These data from previous readouts are presented to insure non-redundant continuous reporting of change and construction by reminding the PI of what has already been reported, to complete the description of fixed facilities, if changes have been noted, and to identify updating requirements if a description update is indicated.

6. PI Notes, which the PI entered for the benefit of the next readout but which have not been included in the output.

7. Latest Briefing Board

a. The date and mission reference to the mission photography which was used in the Briefing Board.

b. The significance of the Briefing Board to alert the PI to a possible requirement for an update and to indicate recent subjects already covered by Briefing Boards.

8. OB and Mobile Equipment Readouts, including mission identification and the OB and mobile equipment readouts from the last two or three missions on which these items could be reported to assist the PI in item identification, and to help standardize nomenclature. In this case it was recognized that the last two or three missions would not adequately support PI reporting of new types of OB at a target, unusually large or

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small numbers of OB, or other alerts to the community. However, it was determined that the present practice of maintaining all readouts for COMIREX targets could be extended and improved by automatic generation of such summaries, in a slightly different form, for each target as readouts were added.

9. Recent Photo References, a list of the last five photo references to support investigation of features noted on current film which were not previously reported. This list will be automatically updated for each readout.

10. Map Reference, a list of references to available maps covering the target.

4.1.2 PI Worksheet

The PI Worksheet appears as an input to Phase I Readout and Phase II Readout as one of two types of pre-printed formats. These are illustrated in Figures 116 and 117. When filled out, these serve as an input to Data Entry and Approval, Phase I and II (see Section 3.1.4).

The basic worksheet (Figure 116) is designed to (1) separate readout items to permit selective automatic data handling in product generation and file maintenance, (2) allow the PI to retrieve information to be included in output reports in lieu of handwritten entries, (3) facilitate PI control of presentation content, and (4) insure input of certain data, without manual manipulation, in a form consistent with selective retrieval, automatic summarization, and collation. This worksheet is available in versions which provide expanded space for entry of photo references (search targets or large complexes), changes and construction (expanding targets), and OB and Mobile Equipment readouts (military installations). The PI will select the proper version after reviewing the film and determining the probable extent of his report.

In Phase I readout the basic worksheet, or a version thereof, is employed for all targets, since a report on all targets is provided as an output product. In Phase II readout of film which was also read out in Phase I by the Center, the basic worksheet is employed when change or OB is noted at a target. However, a special worksheet (Figure 117) is provided for use in this Phase II readout where the target shows no change or does not require an OB report. Here, only a photo reference and a change of the date of the basic description (when photography allows) are required as a PI output. These items, which are employed only in data base maintenance, can be recorded for several targets on a single worksheet.

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MACHINE REFERENCE NO. _____

PHOTO REFERENCES:

	PASS, FRAME, AND FILM COORDINATES	LIMIT. COND.	QUAL.	COVERAGE	MODE
A*					
A					
A					

ACTION ON THE DESCRIPTION OF FIXED FACILITIES:

B ☐ VALIDATED
C ☐ UPDATED
D ☐ INCLUDE AS OUTPUT
E ☐ ENTER AS MODIFIED IN OUTPUT

REPORT OF CHANGE OR CONSTRUCTION:

F ☐ ID ONLY
G ☐ NAC
H ☐ NAC SINCE _____
I ☐ NEGATIVE REQUIREMENTS RESPONSE
J _____

(SPACE CONTRACTED FOR ILLUSTRATIVE PURPOSES)

IDENTIFY FRAME FOR EACH REPORT, IF MORE THAN ONE PASS

PI NOTES (NOT TO BE SENT OUT):

K _____

(SPACE CONTRACTED FOR ILLUSTRATIVE PURPOSES)

OB AND MOBILE EQUIPMENT READOUTS: (IF LOCATION IS IMPORTANT, ENTER AS L1, L2) [e.g. L1 - AT SUBRASI:]

	NOMENCLATURE	NUMBER	REMARKS
L			

M REMARKS ON NEW OR UNUSUAL OB _____

BRIEFING BOARD CANDIDATE:

N ☐APPROVED READOUT TO SELECTION FUNCTION

ADDITIONS, DELETIONS, AND CHANGES TO PRESENTATION

LINE OR ENTY NO.	TYPE OF INPUT

(SPACE CONTRACTED FOR ILLUSTRATIVE PURPOSES)

PI TIME:

O TARGET READOUT TIME (MINUTES)_____

RECOMMENDATION FOR OUTPUT (PHASE II REPORTING)

P CHANGE REPORT

Q OB REPORT

* LETTER IS KEYED IN TO CALL OUT A UNIQUE SUBROUTINE TO HANDLE PI ENTRY RETRIEVAL INSTRUCTION, AND/OR DATA BASE MAINTENANCE INSTRUCTION

Figure 116 Basic Worksheet Format

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MACHINE REFERENCE NUMBER		PASS, FRAME, AND FILM COORDINATES	LIMIT. COND.	QUAL.	COVERAGE	MODE	CATEGORY
	A						
	B	☐ DESCRIPTION STILL VALID					
	A						
	B	☐ DESCRIPTION STILL VALID					
	A						
	B	☐ DESCRIPTION STILL VALID					
	A						
	B	☐ DESCRIPTION STILL VALID					
	A						
	B	☐ DESCRIPTION STILL VALID					
	A						
	B	☐ DESCRIPTION STILL VALID					
	A						
	B	☐ DESCRIPTION STILL VALID					
	A						
	B	☐ DESCRIPTION STILL VALID					
	A						
	B	☐ DESCRIPTION STILL VALID					
	A						
	B	☐ DESCRIPTION STILL VALID					
	A						
	B	☐ DESCRIPTION STILL VALID					
	A						
	B	☐ DESCRIPTION STILL VALID					
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	B	☐ DESCRIPTION STILL VALID					
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	B	☐ DESCRIPTION STILL VALID					
	A						
	B	☐ DESCRIPTION STILL VALID					
	A						
	B	☐ DESCRIPTION STILL VALID					
	A						
	B	☐ DESCRIPTION STILL VALID					
	A						
	B	☐ DESCRIPTION STILL VALID					
	A						
	B	☐ DESCRIPTION STILL VALID					
	A						
	B	☐ DESCRIPTION STILL VALID					
	A						
	B	☐ DESCRIPTION STILL VALID					
	A						
	B	☐ DESCRIPTION STILL VALID					

Figure 117 Special Worksheet Format

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The sections of the basic worksheet, two of which appear in the special worksheet, are employed as follows:

1. Machine Reference Number - a five character number printed on the presentation sheet which is to be entered on the worksheet to guide automatic retrieval of, or change to, information presented to the PI.

2. Photo References - Spaces for entering the actual pass, frame, film coordinates and coded interpretability data. The codes for limiting conditions, film quality, coverage, and mode are presented to insure consideration. The number of such spaces will vary on alternative worksheets to permit a large number of passes to be recorded on large targets (e.g. missile complexes).

3. Action on the Description - Boxes to be checked to initiate computer action. A check in the box marked "Validated" will effect a change in the mission and film references contained as an initial entry in the description of fixed facilities. A check in the "Updated" box will also change this mission and film reference and will notify the computer to execute any additions or deletions to the description which have been entered in the section on additions, changes, and deletions (at the bottom of the sheet) or question the use of the box when update material is not entered. A check in the box marked "Include Description in Output" will initiate automatic retrieval of description of fixed facilities for display to the edit and approval function and subsequent inclusion in immediate reporting for that target. A check in the box marked "Enter Description as Modified" will effect changes entered in the section on changes, additions, and deletions (bottom) which are identified with an "O" in the second column, and will enter the result for display to the edit and approval function. This section will not be recognized by the computer on the worksheet for targets for which Third Phase "Basic Reports" are prepared (no updating nor complete reporting on First and Second Phase readout).

4. Changes and Reports on Construction - Any of four stock reports may be checked in reporting change and construction, or alternatively, the PI may enter any textual description required. The four stock reports shown on the illustrated worksheet concern identification only,

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No Apparent Change (two types), or a statement which is completely responsive to the readout requirement (for example, "No new construction, changes to facilities and features not previously reported were observed.") In the latter case, the check mark would initiate action to retrieve the readout requirement and perform a slight modification, relieving the PI of the requirement to write out this statement.

5. PI Notes - Space is provided for PI notes to himself or the next PI reading out the same target. These remarks will only appear on the next presentation. They are not included in NPIC output.

6. OB and Mobile Equipment Readout - Space is provided for tabular listing of mobile objects in proper format for file input. Space is also provided for textual alert remarks concerning unusually large or small numbers of OB, new types of OB, etc.

7. Briefing Board Candidate - A box may be checked to indicate that photography is adequate for use in a briefing board on a previously selected subject (indicated to the PI by an asterisk on the machine reference number in the presentation) or is recommended by the PI as a briefing board subject. This check mark will cause dissemination of the approved readout to the briefing board selection function.

8. The last section (in which the data entry space has been greatly compressed in Figure 116) is provided for changes, additions, and deletions. In the presentation, each section is given an entry number, and within each section, each line is given a line number. To make a deletion from the presentation, the PI will merely enter the entry or line number in the left hand column and a "D" in the second column. To add a line, the PI will enter the line number immediately preceding the point of desired entry, enter an "A" in the second column and enter the content of the insertion in the right hand data section. The section will also be employed to modify a description of fixed facilities for inclusion in the output report when required under conditions of partial coverage or partial observation of the target. An "O" entered adjacent to any of the above coded entries in the second column (for example, "DO" for deletion) will cause this modification to data retrieved from the file for inclusion in output.

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An attempt has been made to offer the PI maximum use of check marks, line numbers, etc., in lieu of textual composition and data recording. Still, it has been held necessary to provide maximum flexibility for PI descriptions of change and construction, and in making remarks. In accordance with the requirements for PI initiation of deletions from the presentations for future readouts and the inherent requirement for PI updating of the description of fixed facilities for certain targets, an attempt has been made to make these actions as easy as possible.

4.2 Interface Summary

Each process, function and activity of the IIS is bounded by the information which enters and leaves it. The interfaces which bound the entire system (i.e. the System Inputs and System Outputs) have been described in Section 2. In Section 4.1, the principal internal interfaces to the system were likewise described in some detail. We have reduced the data about each interface which is important to system design to a standard form and bound these forms in a separate document so that they can be easily used in conjunction with the flow diagrams of Section 3.

Each form contains the interface name and a reference number which correspond to the words and numbers in and above the ovals appearing in the information flow diagrams of Section 3. The source and destination of the information is also indicated. In certain cases there may be multiple sources and destinations, e.g. a hard copy reference document which is used in many different processes or a request/reply serviced by the Query Handling activity (Section 3.3.2) which varies only as to actual information content. In such cases we have added to the basic form a list of the multiple sources and destinations. The form also indicates the form of the interface, hard copy, display, core record, drum record, tape record, etc. and the frequency with which it is generated. Too many variables affect the latter item to permit measurement in terms of absolute time except in rare cases; therefore we have used identifiable units such as "once/mission", "once/target", etc. In estimating computer and console loads, these frequencies were converted to time using the basic 'Integrated Information System Design Parameters" agreed to by the Center.

Data volumes are given in terms of numbers of characters wherever applicable. If the volume is too variable to admit of any reasonable sort of average or if it is not relevant to the system design, this fact has been indicated. Under Content and Organization we have provided a brief description of the data provided by the interface; no attempt has been made to prescribe a format.

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4.2.1 System Interfaces

The forms which represent the inputs and outputs of the IIS as a whole are shown in Table XL. Thus either the source or destination of the data is external to the system. The activity to which they interface is shown by a two-digit code corresponding to the last two digits of the appropriate part of Section 3. For the specific function or activity which receives or generates the interface, see the appropriate flow diagrams.

4.2.2 Activity Interfaces

A matrix of the interfaces between activities is shown in Table XLI. The letter "I" or "O" in a given column indicates whether the interface is an input or output of the activity.

It should be noted that on these forms, the source and destination are both shown as two-digit codes corresponding to the appropriate activity numbers.

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TABLE XL

SYSTEM INPUTS AND OUTPUTS BY ACTIVITIES

SYSTEM INPUT	INTERFACE	ACTIVITY																												
		1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	4.4	4.5	4.6
Camera Characteristics	11- 1	I																			
Orbital Data	11- 2	I																			
INS Data	11- 8	I																			
[redacted]	11-12	I																			
Pass/Frame KH-4	11-33	I																			
COMIREX Update Data	11-63	I																			
Team Specialty Update	11-64	I																			
Manhour/Target Update	11-65	I																			
Blank Worksheets	12- 1		I	I																	
New Target Forms	12- 2			I																	
PI Cable Worksheets	13- 2			I																	
Current Intelligence	16- 2						I														
Mission Prints	16- 4						I														
Scheduled Update Requirements	21- 1									I											
Internal Report Requirements	21- 2									I											
External Report Requirements	21- 3									I											
Requested Document	21-10									I											
Annotated Prints	21-14									I											
Basic Report Responsibility List	22-34										I										
Manual Data	31- 1												I								
Request for Information	32- 1													I							
External Basic Intell. Report	33- 1														I						
Basic Report Responsibility	33- 2														I						
Field Cable Report	33-12														I						
Reply	33-17														I						
Credibility Criteria	33-24														I						
Tactical Aircraft Film Cans	41- 1															I					
Mission Film Cable	41- 4															I					
Destroy and Archive Instructions	41- 5															I					
Mission Film Cans	41-18															I					
Report from External Sources	45- 8																			I	
External Target Ident. Data	46- 1																				I
Request for New Target	46- 8																				I
CSD Recommendation (New Target)	46- 9																				I

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TABLE XL (Cont'd)

SYSTEM INPUTS AND OUTPUTS BY ACTIVITIES

SYSTEM OUTPUT	INTERFACE	ACTIVITY																							
		1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	4.4	4.5	4.6				
Predicted Map Requirements	11-23	0																							
Photo Reference and Notes	12-11		0							0															
Cable Text	15- 3					0																			
Verification Copy (Cable)	15- 4					0																			
Text and Graphic Selection	16- 9						0																		
Finished Notes	16-10						0																		
Request for Photography	16-11						0																		
Transmitted Data	17- 9							0																	
Mats for PSD	18-20								0																
Verification Copy	18-23								0																
Punched Tape	18-24								0																
Request for Document	21- 9									0															
Mats for PSD	23- 8											0													
Transmitted Query	32-11														0										
Query to Report Originator	33-16															0									
Film to Archive	42- 7																0								
Film for Destruction	42- 8																0								
Mats	45- 7																			0					

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TABLE XLI

ACTIVITY INTERFACE MATRIX

INTERFACE	ACTIVITY																							
	1.1	1.2	1.3	1.4	* 1.5	1.6	1.7	1.8	2.1	2.2	2.3	3.1	3.2	3.3	3.4	1.1	4.2	4.3	4.4	4.5	4.6
11-31	O	I																			
11-32	O		I																		
11-42	O			I																	
11-57	O	I/O	I/O	I																	
11-59	O	I																			
11-61	O															I					
11-60	O		I																		
12- 6		O	O	O		I															
12- 7		O	O	I																	
12- 8		O	O	I																	
12-10		O	O																		I
12-16	I	O																			
13- 4			O	I																	
14-51				O		I	I	I													
14-56				O					I												
14-59				O				I													
14-64				O						O		I		O	O				O		
18- 4								O											I		
21-11									O	I											
21-15									O		I										
23- 7											O								I		
32- 1		O	O	O		O			O	O			I								O
32-54		I	I	I		I			I	I			O								I
33- 5														O					I		
33-23			I											O							
41-17	I											I			O						
41-20															O	I					
41-23		I	I												O		I				
42-15		I	I						I							O		I			
42-16		O	O						O							I		O			
42-17		O	O						O							I		O			
42- 1		O	O						O									I			
44-11		I	I						I									O			
44-16		I	I						I									O			
46- 4				I																	O

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5. SYSTEM CONFIGURATION

Performance of the various processes necessary to convert system inputs into the specified output products requires a carefully selected collection of hardware, software and files. In Section 3 the necessary components were identified generically, the actual selection of the configuration required that the various functions which a given component serves be carefully reviewed and modified if necessary to reduce the number of different system components to a minimum. It is highly desirable, for example, to have a single file maintenance program to service all files and to use the same type of remote console for as many as possible of the man-machine interface processes. This commonality can be expected to sharply reduce maintenance problems and if caution is observed to avoid using overly elaborate components for simple functions, simply to obtain commonality, initial costs can also be reduced.

The description of system activities in Section 3 and the system configuration described below are, in fact, the end result of several iterations on the system design, each iteration leading closer to the desired design goals of simplicity and economy.

It should be recognized, however, that there are two boundary conditions which constrain the configuration. First, it has been agreed that the central computer complex be centered about dual Univac 494 computers and second, the executive program which controls the operation of the computer complex is to be the RUM-ART system as developed jointly by NSA and NPIC.

The probability that Univac 494's would be used as the central computers was recognized early in the development of this design. The costs of reprogramming existing applications and restraining programming personnel would be difficult to recover in a reasonable time frame unless a satisfactory substitute computer could be acquired at a substantially lower cost. Even then, the problems of changeover and the space and time required for dual operation while the new system was being checked out make introduction of a different computer unattractive.

The economics of executive system development indicate that although use of the RUM-ART system jointly developed by NSA and NPIC imposes some restrictions on the real-time functions of the IIS (e.g. core memory for the IIS is limited and allocation of what is available is not completely free), it is less costly to construct the IIS programs to conform to these

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5.1 Hardware

The physical components which must be combined to support the IIS are shown in block diagram form in Figure 118. The quantities of each type of equipment, the physical location of units and the percentage of available time which is expected to be utilized on each unit, assuming the workloads implied by the system design parameters is shown in Table XLII. The list of equipment shown in this table has been constrained by several factors:

a. Dual Univac 494's with their associated peripherals will, by agreement, be used as the central computer complex.

b. Existing remote equipment (e.g. mensuration consoles, plotters, etc.) which are already owned by NPIC must be used to the maximum extent possible.

c. In the selection of new equipment, commonality to reduce costs and maintenance problems and to identify equipment with multiple capabilities to improve utilization has been a principal design goal.

d. The physical separation of NPIC divisional components using comparable devices has made duplication of equipment necessary in some cases where actual utilization does not warrant it.

5.1.1 Computer Complex

The computer related components for the IIS are defined as those hardware components necessary to support the software design discussed in Section 5.2 and consists of 12 categories of computer oriented hardware:

1. Central Processors (includes central processing units and memory units)

2. Mass Random Access Stores (includes necessary control units)

3. Rapid Random Access Stores (includes necessary control units)

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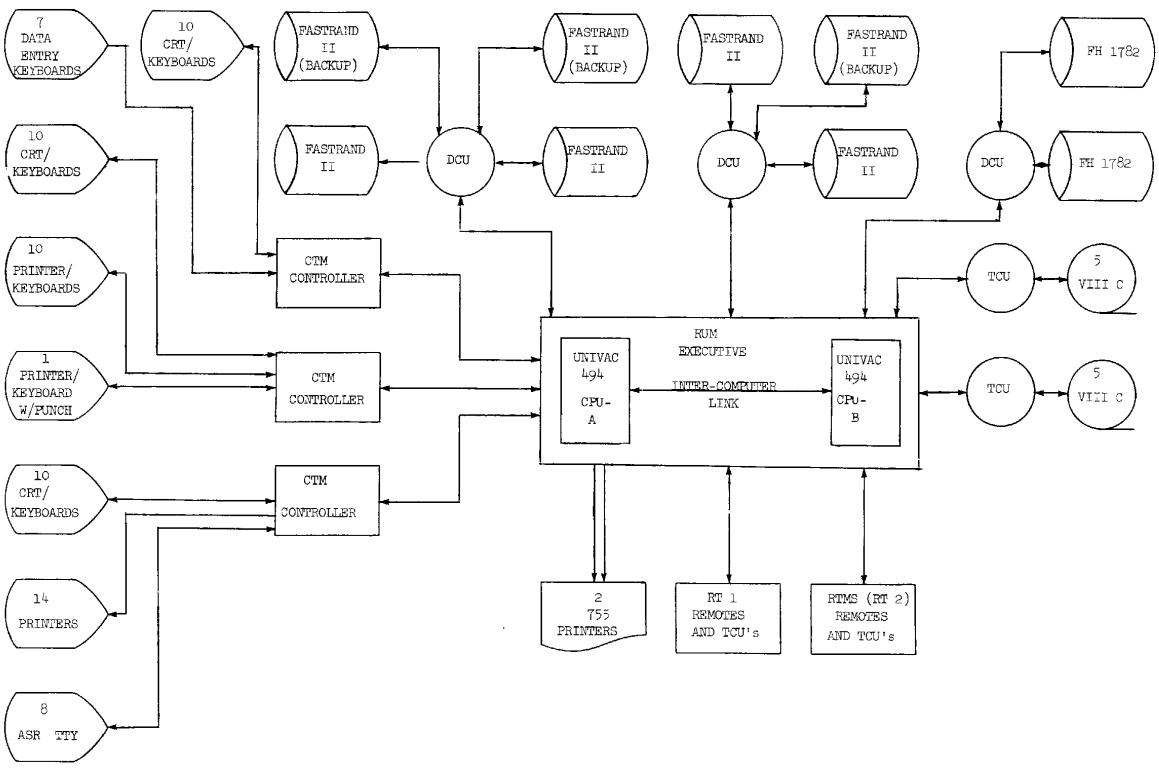

Figure 118 Hardware Configuration in 1971 NPIC Computer Environment

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TABLE XLII

IIS EQUIPMENT INSTALLATION AND UTILIZATION

UNIT	USE	LOCATION	QUANTITY	PERCENT UTILIZATION
Edit Console U/L Case	Verify	PAG	7	77.9
Edit Console U/L Case	Edit	PAG	3	72.8
Edit Console U/L Case	Approve	PAG	2	54.5
Query Console	SUSIE	PAG	5	49.
TTY-Printer/Kbd.	PI	PAG	10	16.
TTY Printer	PI	PAG	10	16.
TTY Kbd. U/L Case	Data Entry	PAG	4	55.
Plotter 635	Graphics	PAG	1	As Req.
Edit Console U/L Case	Data Entry	CSD	3	80.
Edit Console U/L Case	Verify	CSD	2	86.5
TTY Printer	*	CSD	2	0.7
Query Console	SUSIE	CSD	2	37.2
Console U/L Case	Edit	PD	6	64.8
TTY Kbd. U/L Case	Data Entry	PD	3	64.5
Auto. TTY W/Punch	Cables	OS	1	19.8
Printer 600 LPM	Pg. Print	Computer Room	1	1.7
Card Reader	MPF	Computer Room	1	0.1
Paper Tape Punch	Reports	Computer Room	1	7.4
TTY Printer/Kbd.	Film Records	PSD	2	60.8
TTY Printer	*	IAS	1	As Req.
Plotter 635	Graphics	IAS	2	As Req.
TTY Printer/Kbd.	Mens.	TID	6	57.6
Plotter { Model H / Model LTE	Graphics	TID	1 each	6.4
TTY Printer	*	DIAAP	1	As Req.
Plotter Model LTE	Graphics	DIAAP	1	As Req.

6. Multiplexors-devices to control remote access consoles.

7. High Speed Printers (600-1000 line/min)

8. Card/Printer Processor (e.g. Univac 1004)

9. Remote Input/Output Consoles (CRT/keyboard devices)

10. Remote Medium Speed Printer/keyboard (print speed-40 char/sec)

11. Remote Medium Speed Printer (40 char/sec)

12. General Purpose Plotters

Section 5.1.2 deals with the rationale for selecting the storage media for the mass random access stores, rapid random access stores, and the serial access stores; section 5.1.3 describes in detail the Remote Consoles (items 7-12 above). The central processors, general purpose I/O channels, and the multiplexers have been selected as the minimum Univac 494 configuration necessary to support a fully operational IIS system. However, it should be noted that all three of these devices are expandable or "shrinkable" depending upon operational experience, e.g. 3 multiplexors have been selected to handle seventy (70) remote stations but additional multiplexors can be added to the configuration if more consoles are needed.

5.1.2 Storage Media

The media for storage have been selected depending upon the frequency of utilization of the data within the IIS. Data utilization falls into three categories and therefore three storage media have been selected.

Frequency of Utilization	Storage Medium
High (e.g. 2000 access/day)	FH 1782 Drum
Medium (e.g. 500 access/day)	Fastrand II Drum
Low (e.g. 50 access/day)	VIIIC Tape Unit

5.1.2.1 High Utilization

The data which falls into this category includes (1) the IIS operational programs, (2) Index Records (IR), (3) Indices, and (4) Working

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	No. of Bits
Indices Broad Term Indices - 17.6×10^6 Unique Term Indices - 11.01×10^6	28.61×10^6
Index Records	22.5×10^6
Operation Programs	6.0×10^6
Working Storage Status List - 2.16×10^6 Working File - 54.0×10^6 Misc. Working Storage & Files - 5.0×10^6	61.16×10^6
Total	118.27×10^6

Capacity of FH 1782 Drum =
2,097,152 30-bit words or
62.91×10^6 bits

Therefore two FH 1782 are required with a total bit capacity of 125.82×10^6.

5.1.2.2 Medium Utilization

This category of data includes all files in the National Data Base. The files and these initial sizes are listed below:

File	No. of Bits
IDF	1278.0×10^6
ODF	108.0×10^6
MPF	288.0×10^6
EPDF	138.0×10^6
MTF	24.0×10^6
	1836.0×10^6
or	306×10^6 characters

The growth rate of the above files has been established at 22 million

total size of the National Data Base at the end of the period will be close to 400 x 10^6 characters or 2.4 x 10^9 bits. With the capacity of a Fastrand II Drum at 7.78 x 10^8 bits, the IIS will require four (4) Fastrand II Drums. Three additional Fastrand Drums are included for back-up purposes.

5.1.2.3 Low Utilization

Files that are resident on magnetic tape are used in the IIS for two purposes, (1) system drum loading (programs and the National Data Base resident on magnetic tape to load the operational drum, i.e. Fastrand II's and the FH 1782's, (2) Low Utilization files which are accessed, on the average, less than 50 times per day. Files of this category are:

Management Information Systems Files
Basic Intelligence Reports File
COINS Log
Supplementary Data File

As all these files do not have to be on-line (tape mounted on a dedicated drive) file size estimates do not relate to the total number of tape units required. Therefore, ten (10) tape units appear sufficient to service this low utilization function of the IIS.

5.1.3 Remote Man/Machine Interface Devices

This set of equipment includes a wide variety of devices to implement those system functions requiring console assisted manual operations. These operations include input, output, and modification of system data. Additionally, this set of devices includes the production of all automatic hard copy output such as printed text and machine plotted drawings. Specifically the equipment group consists of the types of devices in the quantities shown in Table XLIII. It should be noted that all devices are not utilized as indicated by their nomenclature in Table XLIII. For example, some edit consoles will be used for data entry devices. The following discussion of equipment use on a system function basis will identify these applications and explain the necessity for each device.

5.1.3.1 PAG Activity Area

The equipment to meet the system requirements for this activity will be 12 edit consoles, 5 query consoles, 4 data entry consoles, 10 teletype

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TABLE XLIII

IIS MAN/MACHINE INTERFACE DEVICES

EQUIPMENT	QUANTITY	REMARKS
Query Consoles	7	Includes Keyboard/CRT display
Edit Console U/L Case	23	Keyboard/CRT display/Light Pen and Upper/Lower case capability on CRT display
Data Entry Console	7	
TTY Keyboard/Printer	12	25 char./sec. - Used as query console
TTY Printer	14	25 char./sec. - Used as remote display
Card Reader	1	
Paper Tape Punch	1	110 char./sec.
Line Printer	1	600 lines/minute
TTY with Tape Reader/Punch	1	25 char./sec.
TTY - ASR Units *	6	10 char./sec.
Plotter *	1	Concord Control E-80
Plotter *	1	Benson - Lehner - H
Plotter *	1	Benson - Lehner - LTE
Plotter *	1	Benson - Lehner - STE
Plotter *	5	Calcomp. 635

* These devices are already at NPIC.

tube (CRT) display which displays both upper and lower case alpha/numeric characters, a cursor with appropriate controls such as a light pen or ball control function keys as required, an alphanumeric keyboard, and a telephone. The consoles will be set up for the normal function by standard procedures and be operated in generally the same manner for all three types of processes. The operator will key in a machine reference number to obtain a display of desired target readout. The displayed information will be checked against the handwritten worksheets. Corrections, as required, will be made by positioning the cursor over the area where a change, addition, or deletion is needed and the appropriate function key activated, followed by keying in the appropriate changes from the keyboard. If the readout has additional data, the operator will call up the next page to be displayed and perform his function for each page. When the operator's function is complete the appropriate function key will be activated to indicate that the target readout has been verified, edited, or approved. The edit consoles may also be used to query the data base to resolve conflicts by using function keys and the keyboards. Query responses will be displayed on the CRT. In those cases where conflicts cannot be resolved by the console operator, the telephone will be used to initiate conferences with the PI, team captains, and supervisory personnel.

The five query consoles will have "SUSIE" operators to process the complex PI queries (see Figures 18, 21, 53, 59). The query consoles will be similar to the edit consoles but will not require a cursor. The operator will receive telephone requests for information from NPIC personnel and operate the keyboard to obtain the requested information. The data will be displayed on a CRT and when the operator is satisfied that the proper data has been received will route it to the requestor.

The four data entry consoles will consist of upper/lower case keyboards and a telephone. These units will perform the data entry functions (Figures 19, 24, 26, 27). The operator will receive hard copy of worksheets and other text and enter it into the Working File via the keyboard. The telephone will be used to receive short entries for hard copy data requests and to resolve legibility problems. Since, in this case, data entry is followed almost immediately by a verification function, no read-back of data to the original entry operator is considered necessary.

The 10 teletype printers and 10 ASR teletype units will be used with telephones to make up the PI consoles which will be distributed throughout the work area. When the PI requires additional information from the system, he will use one of the consoles to obtain the information. If the query

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A Calcomp 635 on-line plotter will be installed in the PAG area to provide plotted material as required.

5.1.3.2 CSD Activity Area

The system requirements for this activity necessitate the use of 5 edit consoles, 2 Query Consoles, and 2 TTY printers. Of the 5 edit consoles, two will be used for verification of Basic Intelligence Reports (see Section 3.2.2) and will be operated in the same manner as the verification consoles described in Section 5.1.3.1. The other 3 edit consoles will be used primarily to enter data for maintenance of the data base (Figure 67). For this function, the operators will enter the data on the console keyboard into the console display memory. The operator will check the accuracy of the new data base data and correct as required before activating the appropriate function keys which will cause the corrected entries to be added to the IIS data base.

The two query consoles will have SUSIE operators associated with them to provide information in response to system queries (Figures 37, 38, 60, 83, 110, 112). The operation of these consoles will be the same as that described in Section 5.1.3.1 for query consoles. The teletype printers are required to print data for selected Briefing Board candidates (Figure 37) and the results of file searches (Figure 38). Also, these printers can be used as designated by the SUSIE operators, to record the results of other system queries as required by IIS system needs.

5.1.3.3 PD Activity

The equipment to support this function consists of 6 edit consoles and 3 data entry consoles. The 6 edit consoles perform final editing functions (Figures 48, 58, 64). The construction and operation of these consoles will be identical to the edit consoles described in Section 5.1.3.1. The data entry consoles will be used for entering data (Figure 56). These are keyboard entry devices, whose operations and construction is the same as that described for data entry consoles in Section 5.1.3.1.

5.1.3.4 PSD Activity

The equipment requirements for this system function will be met by 2 TTY-ASR units (Figures 53, 91, 92, 94, 96, 97, 98). These units will automatically print out requests for film made by other activities and will be used by PSD personnel in the performance of Film Distribution and

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5.1.3.5 OS Activity

The equipment requirements for this section are met by one automatic TTY printer with a paper tape punch and tape reader. These units will print verification copies of cables (Figures 35, 50), and punch tapes for transmission of cable reports (Figure 50). This unit will operate under automatic control by the system and manual operators in the OS area will remove the completed copy and keep the units supplied with blank recording paper and tape.

5.1.3.6 Computer Room Activity

Man-machine devices located in the computer room needed to support other system functions include one 600 line per minute printer with upper/lower case capability, one card reader, and one 110 character per second paper tape punch. The printer will be used for listings and report mats (Figures 4, 6, 7, 14, 15, 92, 108) automatically generated by the system. The card reader is used for the input to the Mensuration Parameters File (Section 3.4.3). The high speed paper tape punch is used to record the system output for the Basic Intelligence Reports which will be later used as input to the photo typesetting equipment in PD.

5.1.3.7 TID Activity

The equipment required to support this activity will be 6 TTY-ASR units, 1 Benson Lehner type H plotter, and 1 Benson Lehner type LTE plotter. The TTY-ASR are existing units and will be used to process mensuration requests in conjunction with the use of existing comparators. The comparators are not included in the IIS equipment complement as they are considered special technical equipment not part of the IIS. The plotters are also existing equipment, but they will be driven automatically by on-line signals derived from IIS data and therefore are included in the equipment complement.

5.1.3.8 IAS Activity

The equipment installed to support this function includes 2 Calcomp model 635 plotters and 1 TTY printer. These devices will be used as required to automatically make plots and provide data to the IAS activity.

5.1.3.9 DIAAP Activity

The equipment installed for this [illegible] 1 TTY printer [illegible]

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5.1.3.10 IPD Activity

The equipment installed for this activity is 2 Calcomp model 635 plotters and 1 Concord Control Model E-80. This equipment will be used as required to automatically generate plots as required by other system activities.

5.2 Computer Programs

The success of the IIS as an improved information handling system is dependent, in large measure, on the computer programs which support and are, in fact, an integral part of the system. In order that the variety of disparate activities requiring computer support be efficiently and economically serviced, the entire software system must be considered as an entity. To establish the design of that entity and its components, it is necessary to examine the system functions requiring computer support (Section 5.2.1) and to determine the specific capabilities implied for the system (Section 5.2.2).

It becomes evident from these investigations that one of the most critical software packages is the Query Language as it represents the major vehicle for user accession to data base information. As a further enhancement of the Query Language, a Presentation Language has been designed to facilitate the structuring of responses to queries when desired. Consequently, these two languages are treated in detail in Section 5.2.3. The remaining programs essential to the operation of the IIS are described in Section 5.2.4.

Finally, since the system must be truly integrated in its performance, it is necessary to consider the environment within which the software must operate. This topic is covered in Section 5.2.5.

5.2.1 Functional Definitions

On a functional level the IIS software can be defined in terms of the support it provides to sixteen (16) functional areas. These areas are defined as follows:

a. File Update and Maintenance - Creation of sections of, addition of data to, and deletion of data from the operational data base, (the ODF, IDF, etc.).

b. Data Entry - Acceptance of input data from various equipment, (keyboard, card reader, etc.), error checking, conversion and formatting of the data for further processing.

c. Verification, Editing and Approval - Support the VEA (Verify, Edit, and Approval) function, including the retrieval, display and modification of data in response to commands from consoles manned by verifiers, editors, and the approving authority.

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e. Query Handling - Decoding of a user-oriented Query Language and retrieval of desired sets of information from the operational data base (ODF, IDF, MPF, EPDF and other files).

f. Cables and Real-Time Reports - Formatting and preparation for transmission of either computer-to-computer information or outgoing cables.

g. Report Generators - Generation of hard copy reports automatically from information stored in the data base.

h. Executive - Control of the entire IIS software system, including all I/O handling, program scheduling, security, maintenance, etc.

i. Update Mensuration Parameter File - Generation of the necessary parameters, on a mission basis, to support both on- and off-line mensuration.

j. Batch Mensuration Support - Similar to on-line mensuration (d) except that support is provided by the IIS in an off-line sense generally using punched cards as input.

k. Target Prediction - Prediction of targets covered by a given mission prior to film arrival.

l. Assignment - Assignment of film and necessary support materials to various PI teams for Phase I and Phase II readout.

m. Program Languages - Provision of assembler and compilers to be used to generate all of the information handling software for the IIS.

n. File Maintenance Language - Processing of an on-line input language similar to the Query Language (e). The language provides the user interface with the maintenance procedures themselves (a) e.g. CSD corrections to Header Information or the addition of collateral material to the IDF.

o. Presentation Language - Processing of an on-line language which permits the user to change or create report formats.

p. Miscellaneous Software - Provision of a collection of programs

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These sixteen functional areas may be logically grouped into eight (8) program packages (groups of functionally related programs). The eight program packages and the functional areas they support are:

1. Update Package
   a. Update and Maintenance

2. Data Entry Package
   b. Data Entry

3. VEA Package
   c. Verify, Edit, and Approval

4. Mensuration Package
   d. On-line/Off-line Mensuration Support
   j. Batch Mensuration Support

5. User Language Package
   e. Query Language
   m. Program Languages
   n. File Maintenance Language
   o. Presentation Language

6. Report Generation Package
   f. Cables and Real-Time Reports
   g. Report Generators

7. Executive Package
   h. Executive

8. Computation and Support Package
   i. Update Mensuration Parameter File
   k. Prediction
   l. Assignment
   p. Miscellaneous Software

The relationship among these eight program packages can best be illustrated in terms of how they are employed when a user interfaces with the IIS data base. Figure 119 relates this user interface to the data base through the IIS software. The IIS data base is represented by the inner circle in Figure 119. Surrounding the data base circle are the eight program packages. The outermost segment of the figure represents

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[redacted]

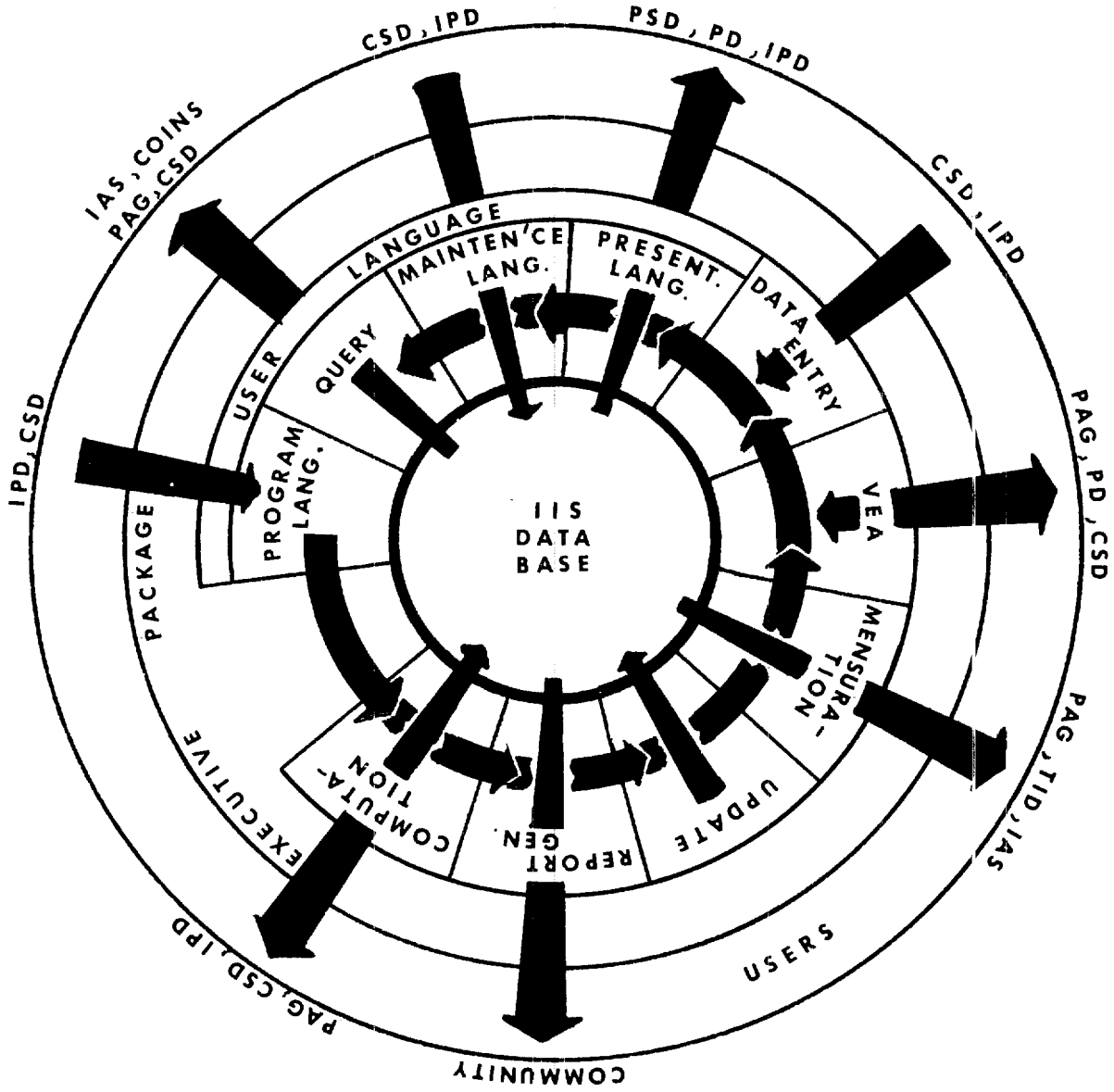

Figure 119 User Interface with Data Base

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Twelve specifications are provided in Volume 1 of Part II of this report. These specifications cover the new programs which must be written to satisfy the requirements of these eight program packages. The activities of Section 3 which utilize each of the programs are shown in Table XLIV.

5.2.2 IIS Software Capabilities

The basic IIS system design encompasses the total operation of the NPIC computer complex. Its purpose is to provide automated support in the creation, maintenance, and exploitation of a unique data base and to provide on-line and batch data processing service for other related functions. Functionally, the system is divided into eight program packages (Section 5.2.1). This design results in an automated system which is oriented to the user. The primary aim is to allow the user to communicate easily with the IIS without requiring that he have an extensive knowledge of computer systems and the internal structure of the IIS.

An initial step in the design process was to determine what elements of information must be in the data base in order to satisfy customer requirements. From the results of this study the content and structure of the data base were developed. (See Section 5.3).

The concept of the index, unit, and sector records described in Section 5.3 emphasize the accessibility of the most pertinent information in a logical fashion. Hence, while the structure is logically similar to other systems, it has been tailored specifically to meet the information needs of NPIC users. Once the data base was established, the five operational capabilities necessary to a complete system could be developed in general terms. These capabilities are described briefly in the paragraphs below:

A. Query Capability - Since the IIS is essentially an information storage and retrieval system, the query capability must be present to allow the user access to any of the data base elements. While the query capability (which is based on a simple formatted language) is not general in nature, i.e., not directly applicable to a diverse set of information types, it is general enough in scope and flexibility to handle the particular needs of NPIC. Further generality at this time would only complicate the use and implementation of the query function while adding very little enhancement of the system.

B. Data Management Capability - This is possibly the most important

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TABLE XLIV

ACTIVITIES REQUIRING SPECIFIC COMPUTER PROGRAMS

PROGRAM \ ACTIVITY	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	4.4	4.5	4.6
DEN Program				★						★		★		★						★
VEA Program				★						★		★		★						★
Automatic Update Program				★						★		★		★					★	★
PIRL Program (Query)		★	★	★		★		★	★	★		★	★	★		★		★	★	★
Report Generator	★				★		★	★			★								★	
Presentation Language		★	★			★		★	★		★		★	★					★	★
Prediction Program	★																			
Assignment Program	★														★					
RT/3 Executive Program		★	★	★	★	★	★	★	★	★	★	★	★	★		★		★	★	★
Photo Reference File Program		★	★						★							★	★			
Data Base Maintenance and Periodic Update												★								
File Control Program	★	★	★	★	★	★	★	★	★	★	★	★	★	★		★		★	★	★

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both the PI Worksheets and on-line update capabilities has been provided in the data management function. The first facilitates immediate entry of large volumes of direct readout information; the second services lower frequency maintenance activities.

C. Presentation Capability - A presentation capability has been integrated into the system to provide the user with a means of specifying report formats for CRT or hard copy presentation. This function eliminates the need for manual reformatting of data obtained from the IIS or re-programming to meet modified reporting requirements. This capability can be combined with the query capability for the automatic composition and preparation of standard periodic reports.

D. Mensuration Capability - Another capability of the IIS is to provide on-line service to mensuration activities. This is principally in support of the on-line comparators presently in use. The capability is essentially singular in nature since it is not intertwined with the query, maintenance, and presentation functions. This capability is presented only for completeness of the overall IIS. The mensuration capability is currently under development at NPIC as a separate entity.

E. Batch-Processing Capability - A final capability is provided which allows "batch" access to the RUM/ART executive by low frequency - non-real-time IIS programs such as prediction, scheduling, and program development.

5.2.3 IIS Language

The IIS languages were developed with the aim of making the data base information as readily available to the user as possible. They were developed for use principally by individuals who have little or no knowledge of the computer complex and of the structure of the data base. The two principal languages are the query language and the presentation language. A series of statements is provided which are straightforward in form and format with major emphasis on simplicity. In essence, an information user need only become familiar with the basic types of information in the data base and the basic information users language. With this knowledge, the information user will be able to communicate directly with the system to retrieve, manipulate, and prepare for presentation any of the data base elements. However, any one individual may only require knowledge of some subset of the basic language. For example, only a limited number of designated users can be allowed to enter corrections or

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5.2.3.1 Query Language

5.2.3.1.1 The IIS Query Language Structure

Generally, the philosophy presented in this section is aimed at a random access information system. It should be noted, that this design approach is equally applicable to serial access mode of storage, the only difference being the time required to retrieve the requested data. This is a necessary design consideration because portions of the IIS data base will be resident on magnetic tape.

a. General Structure

A consideration of the uses of the IIS data base indicates that, in general, retrieval can be conducted on the basis of locating a specific piece of information. Further, the file structure is such that the element about which information is wanted serves to indicate the place in the data base where the information is located. Therefore, the function of the query language in its simplest form is to provide a convenient method of designating the place in the data base where the information will be found.

Perhaps the most important consideration in designing the query language mechanics (language structure) are the indices of the IIS. This is true because the technique of an inverted file (index) gives the system the ability to efficiently accomplish the retrieval capabilities expressed in Section 5.2. The IIS will have two general types of indices i.e. unique term-one argument and one function, broad term-one argument and several functions. A further refinement to the indexing scheme is now presented, that of allowing the user to express a range of arguments in any given index. This means, that if a user is trying to retrieve data pertaining to the set of COMIREX targets that have the first two digits of the number equal to IA through IZ, he does not have to repeat each unique index term to retrieve the total set. One query statement can satisfy this index function. This range of arguments function applies to all broad and unique term indices that are arranged in alphabetic or numeric order. The IIS accomplishes the indexing function by:

1. unique term

one argument	one function
e.g. COMIREX 1G001M	one machine reference number

2. range of terms

n arguments		n functions/argument
e.g. category type	AA	n machine reference numbers
	AB	
	AC	
	:	
	:	
	:	
	AZ	"

3. broad term

one argument	n functions
e.g. CNTRY CHINA	n machine reference numbers

The only complication to the indexing function is caused by the need to handle the following capabilities:

- Specifying a range of terms - this is accomplished by further qualifying the index term, i.e. specify the desired alphabetic or numeric range in either a broad term or unique term index.

- Specifying a search area around a given geographic point. This is again achieved by further qualification to the index term by stating the function (search), area to be searched, and geographical point of center of search area.

The use of the above indices fall generally into two categories determined by the type retrieval desired, (1) retrieve type query and (2) intersection type query.

(1) Retrieve Type Query

This is used when the originator of the query knows the exact data set he wishes retrieved. Normally the index function will be based on a unique term argument. The mechanics of this type query should:

a. Require one line of data to express the query

b. Be further qualified by specifying the file, unit record, sector

[illegible] qualified by field(s)

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In a retrieval query, the indexing function is used to inform the retrieval logic of the query language where to locate the desired data set. The structure of a retrieval query takes the form of:

a. FILE ID - identifies the file of concern
e.g. IDF, ODF, MPF, EPDF

b. UNIT RECORD - relates argument of desired unit records and is composed of three parts

1. INDEX NAME - e.g. geo-coordinates
2. ARGUMENT - e.g. 1^{o} square
3. QUALIFIERS TO ARGUMENT

c. SECTOR ID - identifies sub field (sector) of interest

d. FIELD ID - identifies field within sector

e. SEARCH FUNCTION - contains those terms that are to be searched in order to locate information within the sector.

Now we can mechanically construct a query format applying the ground rules that commas (,) separate the five major term fields, qualifiers to the argument under index functions are separated by slashes (/), search function terms are enclosed in parentheses ( ) and the query ends with a period. Each retrieval query statement is preceded by a control statement (the word RETRIEVE). An illustration is as follows:

```
RETRIEVE.
FILE, UNIT RECORD/TERMS/,SECTOR, FIELD, (ITEM, TIME).
```

The simplest form (eliminating optional terms) is represented as:

```
RETRIEVE.
FILE, UNIT RECORD, SECTOR.
```

The IIS Query Language Statements then consist of a string of terms, one term from each class of data base division and one for time. The terms are ordered from left to right, separated by commas, with the term representing the first division on the left, and a period on the right. When additional terms are required to uniquely identify data within a sect
they are enclosed within

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TABLE XLV

QUERY LANGUAGE TERMS

CLASS	TERMS			
File	IDF	ODF	MTF	MPF
Unit Record	Target Name COMIREX Number BE Number NPIC Number Country Military District Geo-Coordinates Category	Object Name US/NATO Code Numeric Code	Object Name	Mission Number
Sector	Header Brief Description Detailed Description Readout Requirements Collateral Notes Photo References Source Data References Fixed Facilities Mobile Readouts (OB) Brief History Complete History	Header Description Measurements Photo References Drawing References Source Data References Where Seen Essential Elements of Information	Description Measurements Photo References Where Seen	Pass Number

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will not naturally reference a given installation in the same way, i.e. some by name, some by COMIREX number, etc. Provision is made for this by having indices that make the necessary cross references. The same is also done for the designation of objects.

(2) Intersection Type Queries

Here, the three indexing functions are utilized in a different way from the retrieval type query to allow a user to logically intersect lists of the functions expressed by the indexing arguments. Say, for example, a user is interested in data about:

1. AAA sites in Poland and
2. Especially AAA sites in [redacted] around a given installation on the border of [redacted]

25X6
25X6

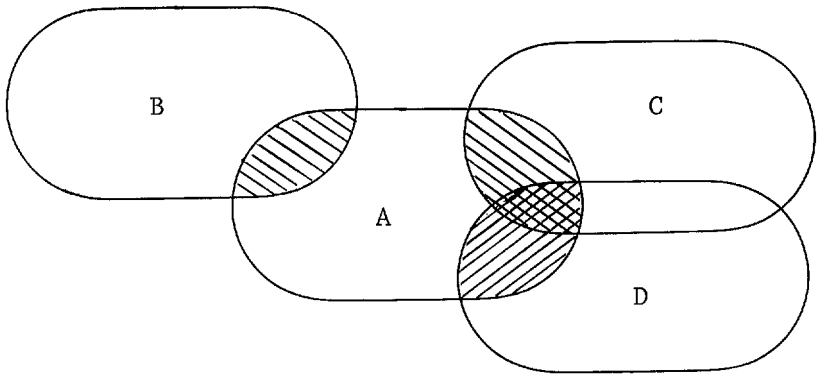
In the indexing logic these arguments are expressed by functions (or a list of machine reference numbers) which satisfy the given argument as shown below:

Argument	Function
Type AAA	All machine reference numbers for AAA sites A
Poland	All machine reference numbers for installations for Poland B

25X6 [redacted]

Argument	Function
Geo-Coordinate	All machine reference numbers for installations within 80 miles of target D

The intersection type query must now express the logical intersection of functions A, B, C, and D or as represented in Figure 120, the shaded portion is the list of machine reference numbers that satisfy the intersection.



All AAA sites in Poland [redacted] 25X6

AAA Sites around

25X1 [redacted] 25X1

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In order to accomplish the above intersection one would express (by index term selection) the appropriate lists, i.e.,

1. list B, also list C,
2. logical AND with list A

resulting in list A' which corresponds to the machine reference numbers for all AAA sites in Poland [redacted] Then to achieve the AAA sites around the given installation one would express

25X6

3. list A,
4. logical AND with list D

After steps 2 and 4, it is the function of the query language to respond to the user giving the total number of machine reference numbers that apply to the intersection. This "preview" gives the user a dialogue capability which in turn allows further refinement to the desired set. This refinement takes place by allowing the user to either add or delete terms to his original set. This is easily accomplished if index list (e.g. A, B, C, D) is developed by one query statement:

1. list B,
2. also list C,
3. logical AND with list A

Then, for subsequent refinement, the user can express:

repeat statement #1 (gives list B) or,
delete statement #1 (eliminates list B) or,
repeat the total argument as expressed by list B, also list C, logical AND with list A by simply eliminating the unit record index term, e.g.,

IDF ,,.

The double commas (,,) in the statement inform the query language that the index list for this statement are taken from the preceding query (statements 1-3).

The mechanics to perform these functions expressed in the example can be accomplished by the following query statements:

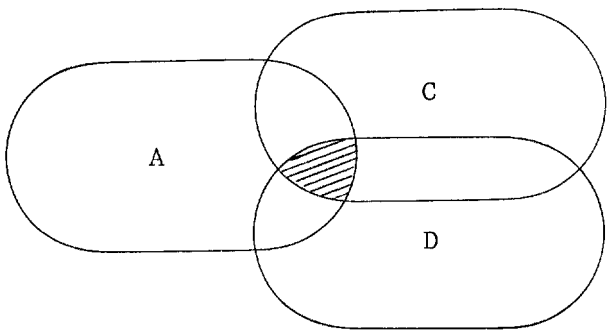
Function	Query Statement
1. list B, also list C,	1. ALSO. 2. IDF, CNTRY POLAND. 3. IDF, CNTRY [redacted] 25X6
2. logical AND with list A	4. IDF, TYPE AAA. 5. DO.

In the list of five queries, the ALSO control statement informs the query language of the function to be performed, i.e. take the last index list (determined by the DO statement, statement #5) and perform a logical AND on all preceding index lists (statements #2 and #3).

3. list A,	6. ALSO. 7. REPEAT 4.
4. logical AND with list D	8. IDF, GEO LAT LON. 9. DO.

Query statements 6-9 are of the same nature as 1-5, the only exception being statement 7 relates the "REPEAT" function, i.e. list A generated by statement 4 is used again in this set of statements.

25X6 Now a further refinement can be made: in the stated example about AAA sites in [redacted] and Poland, assume the user has an initial interest 25X6 in only AAA sites in only [redacted] within a radius of 80 miles of an installation. Presumably, this list could be smaller than the list generated by queries 6-9 above, if for example this geographical location is 25X6 on the border of [redacted] (Some AAA sites could fall within 80 miles but be in another country). Therefore, the data set of interest from lists A, C, and D can be shown in the shaded portion of Figure 121.



25X1 [redacted] 25X1 [redacted]
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To accomplish this intersection, the query language must be capable of first expressing a logical AND of lists A and C, then with the resulting list (A') perform a logical AND with list D. This can be performed by the following query statements:

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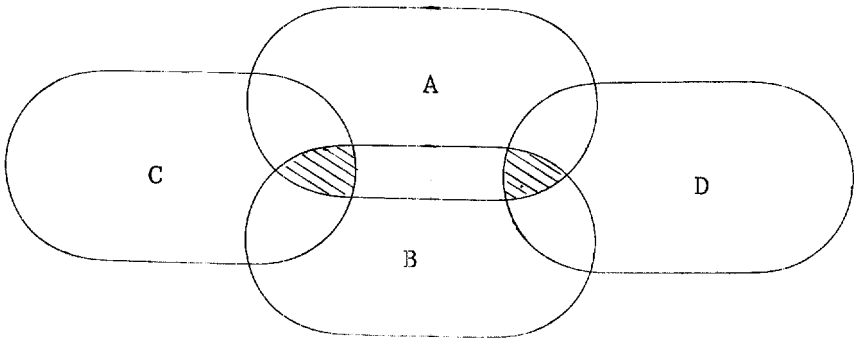
1. INTERSECT.
2. IDF, [redacted]
3. IDF, TYPE AAA.
4. IDF, GEO LAT LON.
5. DO.

The statement INTERSECT informs the language to perform a logical AND on the next two statement index lists (statement 2 and 3) and then take the resultant list (A') and perform a logical AND with the next statement index list (statement 4). The DO statement again states the end of the query.

Again, further refinement to iterative queries can be made by a combination of the ALSO and INTERSECT commands. To explain this use, let

list A = index function to COMIREX 1a's
list B = index function to Type SA-2
list C = index function to CHINA
list D = index function to Viet Nam

Now if a user wished to find the number of COMIREX 1a of type SA-2 in China and Viet Nam, the intersection necessary is shown in Figure 122.



The language statements to accomplish this intersection would be:

1. ALSO.
2. IDF, CNTRY CHINA.
3. IDF, CNTRY VIET NAM.
4. INTERSECT.
5. IDF, TYPE SA-2.
6. IDF, COMIREX 1.
7. DO.

When the user is finished defining the desired data set by use of the intersection type query, he can then revert to the explicit query statement to actually retrieve the desired information.

b. Expandable Capability of the Query Language

The retrieval capability described in the previous sections is indicative of the potential of the Query Language. Since all information files in the IIS data base can be structured in the form of file, sector, field and item, terms could be developed and the basic language used to retrieve any information therein. Two examples are terms which could be utilized to perform logical intersections on the IIS library indices (minicard index and all source index). Examples of each follow:

Index	Example Query
Minicard	ALSO. MCI, 8764200. MCI, 8462300. MCI, 8461340. MCI, 8650000. DO.
All Source	INTERSECT. EDF, GEO COOR 68N 33E. EDF, TYPE SAM. DO.

Further, the Query Language term string will, by design, serve as the interface between the "canned queries" being developed as part of COINS I and the IIS data base. In the future, the term string will also serve as the interface between the IIS data base and the comprehensive language to be developed by the intelligence community for COINS II.

5.2.3.1.2 Sample Queries

Some sample explicit queries are listed below.

The samples represent the type of query that is likely to be asked both by NPIC personnel (internal user) and COINS (external users). Three items are given for each sample: an English language question, the query in two forms, and the answer.

IDF QUERIES

A. Header Queries

NPIC User

Question - What are the coordinates of Severodvinsky Naval Base and shipyard?

Query - IDF, NAME SEVERODVINSKY NAVAL BASE, HEADER. or IDF, COMIREX [redacted] HEADER. 25X1A

Answer - SEVERODVINSKY NAVAL BASE, UR 6434N 03949E [redacted] 25X1A 25X1A [redacted]

External User

Question - List all COMIREX targets within WAC Area 616.

Query - IDF, WAC 0616, HEADER, COMIREX.

Answer - Listing of Header entries for all COMIREX targets within WAC 616.

B. Brief Description and Detailed Description Queries

The description of some fixed facilities (approximately 1000) in the IDF is exceptionally long such that an abstract or shorter description is useful. For these fixed facilities both a Brief Description and the Detailed Description are carried. Queries for installations which have both will be answered with the detailed description. The queries of NPIC and outside users are the same.

Query - IDF, NAME SURABAJA NAVAL BASE AND SHIPYARD, DESCRIPTION.
25X1A or IDF, [redacted] DESCRIPTION.

Answer - SURABAJA NAVAL BASE - FACILITIES COMPRISE A BASE HEADQUARTERS AND TEN ASSOCIATED ADMINISTRATION BUILDINGS; A PROBABLE MILITARY HOUSING/BARRACKS AREA, APPROXIMATELY 50 STORAGE BUILDINGS, APPROXIMATELY 20 REPAIR AND MAINTENANCE SHOPS, TWO COVERED PIERS, THREE FLOATING DRYDOCKS, FOUR FLOATING DRYDOCKS, FOUR LARGE FLOATING CRANES, ONE WHARF, TWO POL PIERS, SEVEN QUAYS, AN AREA OF COVERED PILINGS, AND 15 OTHER PIERS. [redacted] 25X1D

(The installation in the above sample does not have a detailed description.)

*Machine Reference Number

C. Photo Reference Queries

NPIC User

Question - What is the best and most recent photography available on Plesetsk ICBM Complex?

Query - IDF, NAME PLESETSK ICBM COMPLEX, PHOTO REF, BEST. or
25X1A IDF, PIC [redacted] PHOTO REF, BEST.

Answer - PLESETSK ICBM COMPLEX - [redacted] 25X1D

*WAC/PIC Number

Outside User

Question - List all photography on Plesetsk ICBM Complex between
25X1D [redacted]

25X1A Query - IDF, NAME PLESETSK ICBM COMPLEX, PHOTO REF, [redacted] 25X1D
25X1D [redacted] or IDF, [redacted] PHOTO REF, [redacted] 25X1D

[redacted] 25X1D

25X1D Query - [redacted]

Answer - A listing of the mensuration parameters for all
25X1D frames in [redacted] with camera constants.

ODF Queries

Question - Where have you ever seen a Fan-Song radar?

Query - ODF, RADAR FAN-SONG, INDEX, WHERE.

Answer - A listing of all installations where a Fan-Song radar has been seen.

Question - Have you ever seen a Fan-Song radar at Torcpets Regional Mil Storage Instln?

Query - ODF, RADAR FAN SONG, WHERE, (TOROPETS REGIONAL MIL STORAGE INSTLN).

Answer - RADAR FAN SONG - YES.

D. Source Data References

NPIC and external users would ask the same question.

Question - What source data references are available for the PERM ICBM Complex?

Query - IDF, NAME PERM ICBM COMPLEX, REFERENCE.

Answer - PERM ICBM COMPLEX
KH NPIC REPT 226-64
KH NPIC REPT 420-64
25X1C [redacted]

MPF Queries

Question - Give me the mensuration parameters for mission [redacted] 25X1D
25X1D [redacted]

25X1D Query - [redacted]

Question - Retrieve all mensuration parameters for mission [redacted] 25X1D

25X1D [redacted]

25X1D Query - MPF, [redacted]

Answer - A listing of the mensuration parameters for all
25X1D [redacted] of mission [redacted] with camera constants. 25X1D

5.2.3.1.3 Explicit and Iterative Queries

In this section, the capabilities of the Query Language in the explicit and iterative query situations described in Section 5.2.3.1.1 are further described by means of examples.

Explicit Query

Situation: A PI in reading out photography on Installation XYZ sees a large number of Object ABC. The question is whether this represents an unusually large number for that installation.

Approach: Determine what numbers of Object ABC have been seen at that installation in the past as a basis for comparison.

Query: RETRIEVE.

IDF, XYZ, MOB, (ABC).

Response: List of all sightings of ABC objects at installation XYZ including dates and quantities.

Iterative Query

Situation: There is an agent working at the [redacted] (a targeted installation) who is available to take ground photography. However his range of operations is limited to about 10 miles. The question is what installations should he be asked to photograph. 25X6

Approach: Look at the most important installations (e.g. SA-2 sites that are COMIREX 1's) and see what ground photography is available. This is done by first determining the location of the [redacted] 25X6

25X6 [redacted]

Query #	Statement	Comments

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Then generate a list of SA-2 COMIREX 1's that are within 10 miles of the installation:

Query #	Statement	Comments
3.	INTERSECT.	Control Statement
4.	IDF, GEO/SEARCH/10/13 20E/ 52 30N.	Specifies the geo-coordinates index to unit records and argument of a ten mile search around the point.
5.	IDF, TYPE SA-2.	Specifies the category type index to unit records for SA-2's.
6.	IDF, COMIREX 1?.	Specifies the COMIREX # index and specifically, all 1's (? is null character).
7.	DO.	Control statement - triggers an intersection of the list of unit records generated in steps 4-6.

Response - the number of installations that apply to Step 7.

The entry in the IDF on ground photography (CSDIF-CSD Installation Folder) for each of these installations is now retrieved for review:

8.	RETRIEVE.	Control Statement.
9.	IDF,,REFERENCE, (CSDIF)	,,represents that the index to unit records is taken from step #7.

Response - A listing of all the ground photography references that apply to these installations.

The above response might indicate 2 or 3 installations meeting the conditions expressed in steps 4-6, while the response to step 9 indicates they are all sufficiently covered by ground photography. If so, the next step might be to look at COMIREX targets in other categories or at all COMIREX targets.

10.	INTERSECT.	Control Statement.
11.	REPEAT #4.	Control Statement that commands reuse of list generated in step #4.

Response - the number of installations that apply to step 13.

Again the ground photo references are retrieved and reviewed.

Query #	Statement	Comment
14.	RETRIEVE.	Control Statement.
15.	IDF,,REFERENCE.	See step #9.

Response - A listing of all ground photography that applies to all COMIREX targets in this 10 mile square.

The response to step 15 might also indicate that all COMIREX targets have adequate coverage, in which case it would be desirable to extend the radius to 15 miles and retrieve information about all targets. To accomplish this refinement the following query statements would apply:

16. RETRIEVE.
17. IDF, GEO/SEARCH/15/13 20E/52 30N, REFERENCE, (CSDIF).

5.2.3.2 Presentation Language

The presentation language is an extension of the Query Language which allows the user to generate a report in any desired form. The statements correspond to a page format description. In addition to general page layout guidelines, a facility is provided to symbolically specify the placement of information using the same terms as are used in the Query Language. Working in conjunction with the Query Language, information is retrieved from the IIS data base and automatically formatted for CRT or hard copy presentation. Table XLVI is the Statement List for the Presentation Language.

TABLE XLVI

STATEMENT LIST FOR PRESENTATION LANGUAGE

FORMAT - Control statement (defines beginning of statement string)
TITLE - Output page or display heading. (BCD)
LINES - Number of lines per page or display. (Numeric)
CHAR - Number of characters per line. (Numeric)
COL - Column Number. (Numeric)
Column Heading. (BCD Term Mnemonic)
Maximum Number of Characters. (Numeric)
Number of Spaces to the next Column. (Numeric)
TEXT - Sector Mnemonic. (BCD)

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The presentation statement list is preceded by the word FORMAT. This word will be recognized by the IIS executive and simply indicates that a list of presentation statements will follow. The statement list will be preceded by a query statement or statements which generate the necessary retrieval information for use by the Presentation Language.

The entire sequence of statements may be entered on-line or be "canned" for standard periodic reports. Through the presentation language, a report may be easily generated or an existing report format can be easily modified.

An example of how the presentation language will be used will serve to clarify its capabilities.

PROBLEM

An individual wants a listing of all targets in the UUSR with their geographic coordinates. The statements to be generated by the user would be:

```
RETRIEVE
IDF, CNTRY RUSSIA, HEADER, GEO COOR.
FORMAT
TITLE, USSR TARGETS AND LOCATIONS
LINES, 50
CHAR 132
MODE, PRINTER
COL, 1, NAME, 40, 10
COL, 2, GEO-COOR, 12
```

The result would appear as:

USSR TARGETS AND LOCATIONS

NAME	GEO COOR
SEVERODVINSKY NAVAL BASE	643N 03949E
RYAZAN COMPLEX	5437N 03944E
.	.
.	.
.	.
.	.

The example specifies that a header will be printed at the top of each page. The header will consist of the title, USSR TARGETS AND LOCATIONS, and the column headings, NAME and GEO COOR. The NAME column will be 40 characters wide and the GEO COOR column will be 12 characters wide. The report will be printed on a line printer with 50 lines per page and 132 characters per line.

5.2.3.3 Maintenance Language

The concept of a maintenance language was created to give some information users the ability to directly make additions, corrections, or deletions in the IIS data base or create new index and unit records. Rather than create a special language for this function, it was decided to use the query language as the basic vehicle. In this function, only the explicit form of the query language is allowed, i.e. no intersection etc. An additional code has been added which is UPDATE,X. This code will be recognized by the IIS executive to call the appropriate programs into action. The code serves the same purpose as RETRIEVE and FORMAT for the query and presentation functions. The "X" will contain a 'H' for a Header change, 'C' for Add, and 'D' for Delete. The line following the UPDATE code will contain the desired maintenance information. In essence, the line is structured in the same manner that would be required for stating a query. The only difference is that the answer is supplied to the VEA Programs for on-line correction. The Data Management software will contain all the appropriate logic to change the desired record, maintaining or adjusting addresses and indices when the data is returned to the system by the VEA Programs. The individual need have no knowledge of the physical operation of the computer, the Data Management package, or the actual structure of the IIS data base. The use of this function will be restricted to specified consoles and/or individuals in order to maintain control of data base integrity. The following example shows how a designated information user can communicate a change to the IIS.

PROBLEM

The coordinates of the RYAZAN complex have been determined to be in error. The correct coordinates are 5437 N 03944E.

```
UPDATE, H.
IDF, NAME RYAZAN, HEADER, GEO COOR.
DO.
```

These three input statements will cause the display of the incorrect coordinates on the requestor's display screen. In turn, the requestor will correct the coordinates by means of the edit console, and return the corrected value to the system. These actions will cause an update to the IDF.

5.2.4 Other IIS Programs

The IIS Languages described in Section 5.2.3 are the basic techniques

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5.2.4.1 Real-Time Executive System

The basic executive control program for the IIS will be the RUM system jointly developed by NSA and NPIC. Under this basic system, two classes of programs will be operated:

- "Batch" Programs
- Real-time Console Input Programs

The former group are treated in the IIS as worker programs under ART, the latter group will be treated as subordinate elements of a real-time program operating directly under RUM. This real-time program accepts and queues inputs from the IIS consoles, schedules the execution of the appropriate subordinate elements to process the inputs, disseminates output to the proper consoles and processes all real-time transactions with the National Data Base.

5.2.4.2 Verify, Edit and Approval

This subordinate element of the Real-time Executive System controls all transfers of data strings between the VEA consoles and the Working File. It is also responsible for maintenance of the Queue List which contains information on the Working File location and status of all messages in process. Actual modification of the content of the messages is provided by the VEA console and includes the following functions:

Insert Character - Inserts the character entered in the keyboard at the point indicated by the light pen.

Delete Character - Deletes character indicated by the light pen.

Replace Character - Replaces character indicated by the light pen with the one entered on the keyboard.

5.2.4.3 Report Generation

The report generator program accepts as inputs data residing in the IIS working files. It uses a predefined "Report Formats File" to generate briefing board presentations, flash cables, first phase reports, first phase supplements, significant change reports, and basic intelligence reports. The program will operate either in real time or in a batch mode depending on the type of report.

5.2.4.4 Data Entry

This program includes the routines required to accept inputs from various remote devices, perform the necessary code conversions and store the data for further processing by other programs.

5.2.4.5 Update and Maintenance

The Update and Maintenance programs are designed to accept as inputs data which has been entered into the working file either by the data entry function or through the update facility of the Query Language. On the basis of the decoded function instructions the Automatic Update program will determine the appropriate file addresses, and the programs will create, add to, delete from, or modify entries in the data base. At the same time, character counts will be maintained and the validity of old or requirement for new addresses will be determined. When new addresses for file items are required, the proper indexes to the file are automatically created or corrected.

5.2.4.6 Mensuration

There are two versions of the mensuration program currently under development at NPIC, one of which accepts measured point coordinates directly from an on-line comparator, the other accepting inputs from punched cards in a batch-processing mode. In addition to coordinate data, both programs also require as input, control information about each point measured and one or more records from the Mensuration Parameters File. The programs then rectify the relative positions of the points on the basis of the attitude and position of the camera platform and compute ground distances, coordinates and azimuths as required by the control data.

The output is returned to the user in tabular form and, when required, as machine-produced point or line plots.

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The programs are used primarily to process data extracted from aerial photography, but when the necessary camera position and attitude data can be determined, may also be used with ground photography.

Except for minor modifications that may be required to satisfy system requirements, it is not anticipated that changes will be made to the programs now under development.

5.2.4.7 File Control

The File Control program is designed to centralize data base accession by all IIS programs. It is the only IIS program which contains the logical structure of the data base and indexes. Based on a set of input parameters, the file control program will perform searches or make modifications to the data base using a sector as its smallest unit of information. The file control program maintains the indexes and the IIS addressing scheme.

It also has complete control over the Working File to provide file services for all other IIS user programs.

5.2.4.8 Computation and Support Programs

In this set are grouped the programs required by the system which will be run in a batch-processing mode.

5.2.4.8.1 Prediction

This program is designed to compute the film coordinates of all targets visible on the film from a satellite or INS equipped aircraft mission. Using the vehicle position and attitude, camera characteristics and camera on-off times, the program computes the geodetic coordinates of the four corners of the coverage rectangle for each camera on-off cycle. Because of minor errors in reported position and attitude, these coordinates are modified slightly by an empirically determined "fudge factor". The appropriate sections of the geographic index to the Installations Data File (which is organized by one degree squares) are then processed against the coverage rectangles to determine whether or not a target is visible on the film. The distance in nautical miles from the target to the edge of the rectangle is also computed, scaled to film dimensions and used with time to generate the film coordinates of the target. For KH-4 missions there will still be some errors in these coordinates, particularly in the "y" direction because of uncertainties in film start-up time. These can be partially re-

The predicted target list is separated into two lists, one containing COMIREX 1A and 1B targets, and the other containing COMIREX 1C's. These two lists are sorted into the target category specialties of the Phase I, PI teams and ordered by readout priority. The resulting lists are sent to the Team Captains and are used in the assignment function to select and print the necessary PI Presentation Sheets. The total target list is sorted by pass/film coordinate order and separated by the geographic area specialties of the Phase II Readout teams. The lists are again sent to the appropriate Phase II Team Captains and used to generate the Phase II Presentations.

5.2.4.8.2 Assignment

The assignment program uses the Phase I and Phase II Prediction Lists and the Pass/Frame vs. Can Number List to determine the distribution order of film cans to PI teams for Phase I and Phase II Readout. Using the film references on the prediction lists, it searches the can number list and updates the prediction lists by the addition of the can number. Where more teams require the same pass and frame than there are copies available for, a from/to reference is placed on the team lists based on the relative priority of the target to be read out by each team. A cross-reference list showing the team(s) to receive each can is also generated for use by the Film Distribution function.

5.2.4.8.3 Photo Reference

The Photo Reference program and associated Photo Reference File (PRF) is designed to provide direct reference for all photo coverage for any geographical area. The program uses the Mensuration Parameters File (MPF) as its source of information for creating and maintaining the PRF.

5.2.4.8.4 Backup and Maintenance

The Backup and Maintenance program is designed to periodically reorganize randomly stored data base information. It provides for a "compaction" cycle to close random null gaps in random access storage created by the expansion and restoring of data base sectors. Also, by means of a transaction tape and a tape version of the data base, a secondary or "backup" version of the data base is maintained to prevent loss of data through system malfunction.

5.2.4.8.5 Miscellaneous Software

This group of programs includes the multitude of computational routines developed as a result of special requirements and the debugging and diagnos-

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5.2.5 Operational Environment

The IIS operational programs are controlled by one of three real-time systems under RUM. One group of programs can be treated as "workers" and processed in a batch mode under ART. A second group are all related to the mensuration process and hence can be handled by the RT/2 executive system. (This group of programs are already under development at NPIC and are not treated further in this discussion.) The third group of programs are the real-time functions of the IIS and are handled as subordinate elements of the RT/3 program (see Section 5.2.4.1).

5.2.5.1 Batch Programs

The following programs are executed on an infrequent basis and hence can be adequately handled as Worker Programs under ART:

a. Target Prediction
b. Assignment
c. Report Generation
d. Photo Reference File Program
e. Backup and Maintenance

Under these conditions, they are permanently stored in ART's program file and are executed only in response to a specific external request.

5.2.5.2 Real-Time Programs

These programs are designed as subordinate elements of RT/3 and are initialized and executed whenever appropriate data strings, either from external consoles or internally generated by other elements of RT/3 are available. Some of these programs are permanently core resident because of their frequent use, others are stored in an RT/3 program file and are called in as required. This latter group of programs time share a dedicated area of the memory of the RT/3 program. Up to three different segments of these subordinate elements may be in core at the same time. The programs included in this set are:

a. RT/3 System Control (including File Control)
b. Data Entry
c. Verify, Edit and Approval
d. Presentation
e. Query
f. Automatic Update

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Of this set, the System Control element, including the routines of File Control which provide access to and maintain the integrity of the National Data Base are permanently core resident. The remainder are called as required.

It is obvious that improved system response could be obtained if more segments of the latter group could be concurrently core resident, a factor which is particularly important during the immediate readout cycle.

Accomplishment of this objective can be attained,when system loads require, by the comparatively simple modification of the program storage tables in the System Control element and the reassembly of the subordinate elements.

5.3 Files

Table XLVII shows the files which will make up the total data base of the IIS and the activities with which they interface. Three separate categories of files are considered, those which are part of the National Data Base, the permanent internal files required for system operation and the temporary files which are generated during the generation of intelligence information to be published or otherwise distributed. I's and O's on the chart indicate whether an activity may update the file or extract information from it.

Files of the first two categories are described as to use, content, size and structure in Sections 5.3.1 and 5.3.2 respectively. The temporary files are essentially the result of, and used in, specific activities and hence are highly variable. Therefore no detailed description has been attempted. They will, however, conform to the overall structure described in Section 5.3.3.

5.3.1 National Data Base Files (NDBF)

This section describes the content and structure of the five files in the National Data Base.

1. The Installations Data File (IDF)

2. The Moving Targets File (MTF)

3. The Objects Data File (ODF)

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TABLE XLVII

IIS FILES

I - means data from the file is input to the activity.

O - means data from the activity is output to the file.

@ No files specifically required.

* New files can be created only by Activity 3.1. Maintain Data Base, which also has access to all IIS files.

ACTIVITY NAME	1.1 PRE-READOUT	1.2 PHASE I READOUT	1.3 PHASE II READOUT	1.4 DATA ENTRY & APPROVAL (IR)	1.5 CABLE TEXT	1.6 BRIEFING BOARDS	1.7 COMPUTER-TO-COMPUTER LINK	1.8 1st & 2nd PHASE REPORTS	2.1 @ BASIC INTELLIGENCE READOUTS	2.2 DATA ENTRY & APPROVAL (BASIC RPT.)	2.3 BASIC INTELLIGENCE REPORTS	3.1 * MAINTAIN DATA BASE	3.2 QUERY HANDLING	3.3 PROCESS FIELD REPORTS	4.1 FILM DISTRIBUTION	4.2 FILM LIBRARY MAINTENANCE	4.3 MAINTAIN MPF	4.4 MENSURATION SUPPORT	4.5 EXPLOITATION PRODUCTS DATA	4.6 @ NEW TARGET INITIATION
NATIONAL DATA BASE FILES																				
IDF	I	I/O	I/O	I		I/O				I/O		I/O	I	I						
ODF		I/O	I/O	I		I/O				I/O		I/O	I	I						
MTF										I/O		I/O	I							
EPDF						I/O				I/O		I/O	I					I/O		
MPF												I/O	I			O	I			
INDEXES TO ABOVE																				
MACHINE REFERENCE NO.													I/O							
GEOIX	I																			
UR													I							
IR												I	I							
IX													I							
LIR													I							
URAO													I							
PERMANENT INTERNAL FILES																				
TARGET PRIORITIES	I/O												I							
TEAM SPECIALTIES	I/O																			
MANHOUR PER TARGET	I/O																			
REPORT FORMAT						I	I													
BASIC INTELLIGENCE REPORT										I/O										
FILM USE AND LOCATION														I/O	I/O					
STERILE TARGET							I													
SUPPLEMENTARY DATA							I													
COINS LOG												I								
TEMPORARY INTERNAL FILES																				
TEAM TARGET COUNT	I																			
STATUS LIST	O		I/O				I													

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Although the concepts for structuring the files and some comments about their structure are included in this section, details concerning structure have been treated separately in Section 5.3.3. The major emphasis in this presentation is devoted to establishing the contents of these files. The variability in numbers of installations and objects which will be of active interest to the intelligence community limits the utility of a precise analysis of file size. Nevertheless, general estimates have been made of the size of those files for which they appeared to have some basis.

At its inception, applications of the file structure were limited to installations and objects. However, when it became apparent that a common structure for the files not only is desirable but also feasible, the initial concept that information pertaining to both installations and objects would be contained in a single file underwent change. The community interest in mobile objects as entities without concern for their relationship to installations could best be served by a segregation of such information. Further, since there are two types of objects it appeared necessary to extend this segregation and set up two distinct files for mobile objects as well as an installations file. The first of the former files, designated as the Moving Targets File will contain the first type of object, those of special intelligence significance because they are identifiable as unique individual items whose special usage and/or particular features distinguished them from the other members of their class. The second type of mobile objects includes all the remaining ones.

Since use of the files is their common denominator, a structure which is shared by five files is feasible. The fact that it makes the individual file more accessible also makes such a structure desirable. As a result of our investigation into this matter, a common structure is provided.

With this structure all the data pertaining to a particular subject (e.g. the information for one given installation, a single mobile object, etc.) is considered as an individual record which will be given the name "Unit Record". The type of unit record is distinguished by the file containing it. For instance, there is a Target Unit Record (TUR) for each installation in the IDF and an Object Unit Record (OUR) for a single class of object in the ODF.

Every unit record in any of the files will be subdivided into a smaller working part called a "sector". The majority of the sectors are further subdivided into "fields" while some of the latter contain some number of

5.3.1.1 The Installations Data File (IDF)

This file is the most complex as well as the largest of all the files in the IIS. Information will be extracted from it more frequently than from any other file and the allowable access time is likely to be more stringent. These factors require that the file structure be studied in detail and that the rationale for it be firmly established by consideration of its use.

5.3.1.1.1 Uses of the IDF

Among the important uses of this file are those which (1) provide the information required by the PI's, (2) assist in generating the Product Set, and (3) provide answers to queries from users of the system other than the PI's.

- The IDF is the source of the information contained in the PI Presentations which are produced for each Phase I and Phase II readout. The IDF is also the principal source of information requested by the PI during his Phase I and Phase II readouts and provides some of the information he requires for Phase III readouts. These unscheduled requests will be fulfilled by direct access to the IDF.

- Although the information generated by the PI during his readouts is the basis for much of the Product Set, the readouts are influenced by what the IDF contained prior to their commencement. Additionally, the IDF must be accessed for the extraction of information required in preparing some Briefing Board Notes.

- The IDF will be the source of a large portion of the data required in answering queries from other internal users as well as the external users who may access the file by means of the COINS network. These queries may involve descriptive data, information regarding past photo coverage or selected written reports, or specific or summarized data about fixed or mobile objects. Generally such requests will be related to a specific installation.

5.3.1.1.2 Content of the IDF

b. Pass and frame references for each photograph covering the target (all in alphanumeric form).

c. The current (i.e., most recent) description of the installation (in free text) including the fixed facilities at the installation and PI reports of change or construction not included in the current description.

d. Significant collateral data (in free text), i.e., data concerning the installation obtained from sources other than overhead photography.

e. All mobile or semi-mobile objects seen at the target. This will be in numeric form. (A dictionary equating names of objects and their numeric identifiers will be provided.)

f. Map references for the installation.

g. The readout requirements for the installation.

h. The history of the installation divided into two parts to allow easier access to portions of the history. The first part, a concise history, will contain for a given installation its negation date, the first PI readout and all PI reports of change or construction. The initial readout and all PI reports will include a reference to the photo on which its entry was based and the date of the photo. The second portion, called the Complete History will contain a chronologically arranged entry of all readouts, the previous descriptions of the installation and collateral source data which is no longer significant to future PI readouts.

i. Appropriate reports for individual installations. These report references will include a document identifier, its originator and the type of report.

j. Dictionaries or indices equating terms, such as Mission Number to its date, may be included.

5.3.1.1.3 Size

211 million characters with an initial growth rate of 64.2 million characters/year. Further, as the number of installations increase, the growth rate will increase by 7.69 million characters/year each year.

5.3.1.1.4 Structure

As illustrated in Table XLVIII, the sectors into which the IDF is divided are as follows:

a. Installations Header Sector

The fixed-length header is divided into the following twelve fixed length fields:

- Installation Name (combines place name and function)
- Country (coded)
- Military District
- Geographical Coordinates
- BE Number (WAC & BE)
- NPIC Number
- COMIREX Target Number
- Status of Installation, i.e. active, inactive, inactive selected camera systems only, etc.
- Category Code
- Coded Cross Reference to a CSD folder
- Machine Reference Number
- Installation Elevation

The ordering of installations within the IDF will be based on one field of the header, the Machine Reference Numbers. To make retrieval of any given portion of the IDF easier, indices equating the other installation identifiers in the header to this field will be necessary.

b. Brief Fixed Facilities Description Sector

This sector is a combination of fixed and variable fields. The fixed fields contain the latest photo references for which the description is valid. The variable field contains an alphanumeric character string giving the current concise description of the installation.

c. Changes to the Brief Description

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TABLE XLVIII

INSTALLATIONS DATA FILE (IDF)

Sector	Type	Fields	Items
a. Installation Header	Fixed	12 Fixed (Name, BE Number, etc.)	None
b. Brief Fixed-Facility Description	Variable	Variable Number, All Variable	None
c. Detailed Fixed-Facility Description	Variable	None	None
d. Readout Requirements	Variable	None	None
e. Collateral Data	Variable	1 Each Entry	None
f. PI Notes	Variable	1 Variable Each Note	None
g. Photo References	Variable	1 Fixed Each Photo	9 Items
h. Source Data References	Variable	1 Variable Each Reference	None
i. Formatted Fixed Facilities	Variable	1 Each Type of Facility	None
j. Formatted Mobile Equipment	Variable	1 Each Object Sighting	4 Items
k. Concise Installation History	Variable	All Variable	None
l. Complete Installation History	Variable	1 Each Readout - Variable	None

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d. Detailed Fixed Facility Description Sector

This description will be in free-text form. Since it will be included only for the more complex installations, e.g. an ICBM complex, it will contain a much more comprehensive description than is in the brief descriptions. For those installations for which there is a detailed description, the brief fixed facilities description will amount to an abstract of its contents.

e. Readout Requirements Sector

This sector gives the features of an installation which the PI must examine on the imagery whenever it is possible (the E.E.I.). Since the details for formatting this sector have not been established, as presently conceived it will not contain smaller subdivisions.

f. Collateral Data Sector

The new or significant information from sources other than readouts of overhead photography will be contained in this sector. Each entry of collateral source data will be in a variable length field. Their inclusion is designed to direct the PI's attention during subsequent readouts.

g. PI Notes Sector

The sector will include one variable length field for each PI note which is included either for distribution to external users or for PI use to direct his attention during examination of subsequent photography of the given installation.

h. Photo Reference Sector

This sector which provides data on all the film on a given installation will be variable in length. It will contain one fixed length field for each photo reference. Each field will contain nine items for identifying and describing a photo; i.e.,(1) mission number, (2) pass number, (3) frame references, (4) film coordinates of the installation, (5) limiting conditions, (6) quality of the film, (7) coverage, (8) mode, and (9) remarks. Since mission number will probably be the key frequently used for entry to this sector, the fields will be arranged chronologically by mission.

i. Source Data References Sector

j. Formatted Fixed Facilities Sector

This sector gives information on the various fixed facilities, such as the ICBM launch sites or the SAM sites, at an installation. There will be one fixed length field for each type of fixed facility. However, since the types of fixed facilities which they include varies with the installation, the total number of fields which will be contained in any sector cannot be specified. Likewise the number of items in a field is a function of the type of facility. Therefore currently this sector will be treated as free text even though an individual may arrange an internal structure. At such time as the variety of formats can be specified, the sector can be treated in a formatted fashion rather than as free text.

k. Formatted Mobile Equipment Sector

The length of this sector depends on the number of objects sighted at an installation on a given mission as well as on the number of missions for which object sightings were recorded. Although there are alternatives for the structure of this sector, it is believed that one which facilitates chronological retrievals will have the greatest utility. With this arrangement there will be a field for each object sighting. Each field will have an item for date, one for the object classification, one for the number (count) of that object, and one for remarks.

l. Concise Installation History Sector

This is part of the overall history and is designed to include only the portion of the historical data required most often by the PI's during their readout of imagery. Thus it will contain two fixed length fields, one for the installation negation date and one for the date of the photography on which it was first seen. There will also be a variable length field for its initial readout and one for each recording of subsequent change after the initial readout. Each variable length field will contain, in addition to its free-text entry, an item giving the mission number.

m. Complete Installation History Sector

All PI readouts reported to users, except the initial one and the current one, will be included in this sector. There will be a free-text field for each readout. The sector, which is intended to give a more complete history than that of the concise history, is included for those who require a knowledge of what has been reported for an installation. This sector will also contain changed descriptions and inactive collateral data that

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5.3.1.2 The Mobile Targets File (MTF)

5.3.1.2.1 Use

This file consists of alphanumeric data and is designed to give the historic records of movement of those unique mobile objects which are of primary interest to the intelligence community at any given time. In this context, a unique object is defined to be one that the PI can distinguish as being one-of-a-kind; e.g. a specific atomic submarine identified by its registry number rather than its being a member of a class or type.

This file could be considered as a subfile of the Installations Data File. However, because it is of such a high level of interest and because the information contained in it is not always related to an established given installation, it has been designed as a separate, distinct file.

Each object of the Mobile Target File might also be given a fictitious target name, number, etc. allowing it to be stored in the IDF as a distinct target. However, since the file for individual objects need not contain all the information included for permanent type installations, because the objects contained in it will vary with changing interests, and to assist in the maintenance of the file and retrieval from it, it has been established as an independent file.

5.3.1.2.2 Content

The Mobile Target File will contain for each object, the following information:

a. Object Identifier
b. Description
c. Dimensional Data
d. Photo References
e. Sighting Information
f. Readout Requirements*
g. Collateral Data*

* will be added at a later date if applicable.

5.3.1.2.3

An estimate of the maximum size of this file can be based on the

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b. Each object will be seen on less than 20% of the missions.
c. There will be fewer than 52 missions per year.
d. Each sighting can be described in less than 100 characters.
e. The information is of interest for no more than three years.
f. At any one time there will be less than 1000 moving targets of interest.

On this basis the file will be less than four million characters.

5.3.1.2.4 Structure

The likely candidates for inclusion in the MTF are the latest types of military equipment, such as experimental aircraft by serial number and nuclear submarines by registry number and equipment which is of intelligence interest because of its use, e.g. a VIP aircraft. Its structure, which is illustrated in Table XLIX is as follows.

a. Mobile Target Header Sector

This fixed length sector will give identifying information for each record (i.e. mobile target) in the file. There will be fixed length fields for its name, a coded identifier, a machine reference number, and its manufacturer.

b. Description Sector

This free-text sector will consist of a string of alphanumeric characters to present information which will assist in its identification as a unique mobile object.

c. Dimensional Data Sector

There will be fixed length fields to give dimensional data common to all objects, its general shape, its three dimensions and its volume. There will be one variable length field to give those dimensions which are unique to the given mobile object, e.g. the wing span of an airplane.

d. Photo References Sector

This variable length sector will contain information concerning both ground and aerial photographs of a given mobile object. For the ground photography there will be a fixed length field for each photograph containing simply an index identifying the photo. There will also be one fixed length field for each aerial photograph which will again be an identifying index.

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TABLE XLIX

MOBILE TARGETS FILE (MTF)

Sector	Type	Fields	Items
a. Mobile Targets Header	Fixed	4 Fixed (Name, Coded Identifier, Etc.)	None
b. Description	Variable	None	
c. Dimensional Data	Variable	5 Fixed (Shape, Length, Width, Etc.) 1 Variable	None
d. Photo References	Variable	1 Each Ground Photo 1 Each Aerial Photo	None
e. Sighting Information	Variable	1 Each Sighting	None

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e. Sighting Information Sector

There will be a field in this variable length sector for each sighting of the object. The fields will contain items to identify the location, mission number of the sighting, and remarks.

5.3.1.3 The Objects Data File (ODF)

The ODF has been defined as the file maintained by NPIC as an all source collection of graphic and textual information on:

a. All types of military weapons (ground, air and naval) and their support/logistic equipment.

b. All types of significant R and D, communications, industrial and transportation components and equipment.

The file has the following purposes:

a. Its design will facilitate compilation of an all source encyclopedia which is created and maintained by means of automated procedures within the IIS.

b. It will assist in filling the gap created by the loss of experienced personnel, particularly of PI's. This will be accomplished through the automated identification of objects for personnel whose inexperience does not allow their determination as to whether an object is truly unknown or simply one outside their own limited experience.

c. It will allow on-line production of special reports dealing with an object or a set of associated objects.

5.3.1.3.1 Uses

The file will be used with the Query Language (and in conjunction with other files) in answering queries from internal and external users. There are queries for which the generation of answers is possible only if capabilities for on-line dialogue with the files are provided in the IIS. This possibility may be illustrated by the following instance. A PI requires assistance to identify an object. His query to the system might request identification of a cylindrical object longer than 100 feet but less than

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of possible objects and replies from the system will result in either identification of the object or a statement that no match was found.

The ODF will also be used to generate information of assistance to a PI who believes he is viewing a known object but is uncertain of his identification. The file would be used to generate object information displays for this purpose and to update them when required. One of the retrieval functions should be a method by which displays containing references to the best annotated photograph and line drawings and a limited amount of text to describe pertinent details of any object can be produced. The ODF will also assist in generating Briefing Board Notes dealing with a specific object or sets of objects. In those instances when a new object is entered into the ODF, the file would automatically notify the personnel responsible for issuing Briefing Boards. Such notification would include the descriptors in the ODF and any other information available.

5.3.1.3.2 Content

Data about where and when objects have been sighted must be made available. This data could be included in the ODF, in a separate file or in a subfile of another file such as Formatted Mobile Equipment Sector of the IDF. The latter alternative has been adopted and a link to the Installations Data File has been provided in the ODF. This link takes the form of a notation for each object (i.e. classification item) of the installations at which the object has been identified.

For each object in the ODF, the following information is provided:

a. Object Header
b. Description
c. Dimensional Data
d. Photo References
e. Graphic References
f. Source Data References
g. Location Information (the link to the IDF)
h. Readout Requirements

5.3.1.3.3 Size

Initially, the ODF has a potential for 1000 object classes. It has been assumed that the average object class will have about five objects and that 20% of the total would be implemented initially and 20% in each suc-

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5.3.1.3.4 Structure

The file will be divided into the following eight sectors which are shown in Table L. (The information on fields and items included in this table is based on logical deductions concerning the files structure rather than on solid facts. Thus they may be more subject to change than the entries in the other tables.)

a. An Object Header which will identify the object. Its fields will include its name (or possible names if more than one is generally used for an object), a coded identifier, its manufacturer, and a machine reference number. These fields can be fixed in length to conform with the header sector of the other files.

b. Object Description will contain information which helps distinguish one class of object from another. This will be an unformatted string of alphanumeric characters, variable in length.

c. Object Dimensional Data will be contained in five fixed length formatted fields to give the data common to all objects plus an additional variable length field for those dimensions which are unique to a given object.

d. Photo References may be to either of two types of photographs, ground or aerial. Since the photographs themselves will not be on-line in the system, the references will consist simply of an index which identifies the pertinent photo. There will be one fixed length field for each photo. Each field will include a character (or a bit) to allow determination of whether the given one is an aerial or a ground photo.

e. Graphic references will also consist of an index identifying each line drawing of an object. The variable length sector will have one fixed length field for each referenced drawing.

f. Source data references will be the sector which contains pertinent information which has been gleaned from sources other than photography. There will be one variable length field for each report from such sources.

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TABLE L

OBJECTS DATA FILE (ODF)

Sector	Type	Fields	Items
a. Object Header	Fixed	5 Fixed (Name, Manufacturer, Etc.)	None
b. Object Description	Free-Text		
c. Object Dimensional Data	Variable	5 Fixed (Shape, Length, Width, Etc.) 1 Variable for Additional Dimensions	None 1 Each Entry
d. Photo References	Variable	1 Each Ground Photo 1 Each Aerial Photo	1 Each Photo 9 Each Photo
e. Graphic References	Variable	1 Each Line Drawing	None
f. Source Data References	Variable	1 Each Report	None
g. Location Information	Variable	1 Each Location	None
h. Readout Requirements	Variable	None	None

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each location. This field will contain a single identifier for the installation. The sector will be used in answering queries concerning where an object has been sighted and will serve as the link to the IDF to allow answers to queries involving when it was sighted.

h. Readout requirements will consist of a variable length sector containing a string of alphanumeric characters used to specify the requirements. The sector will not be subdivided.

5.3.1.4 The Mensuration Parameters File (MPF)

The National Tasking Plan charges NPIC with the responsibility of creating and maintaining a Mensuration Parameters File.

5.3.1.4.1 Use

The MPF provides the basic data source for the parameters required for photogrammetric mensuration. It is important to note that the MPF is restricted to those parameters necessary to perform mensuration of satellite and aircraft (INS equipped) photography and exclude any results obtained from mensuration activities. It should further be noted that the mensuration parameters for non-routine photography (e.g. attache photography, etc.) that is highly variable and does not allow a consistent method of treatment is not included.

The one possible exception to this restriction against ground photography parameters in the MPF is the data associated with the metrical trap in Moscow. Since in this case there is a large body of unchanging data (the coordinates of a set of well identified points), it appears practical to establish a special unit record within the MPF which will contain this information.

5.3.1.4.2 Content

The content of the MPF is established on the basis of the currently available sources of mensuration data. Within the scope of the definition, the sources are:

- KH-4 Ephemeris Listing
- [redacted]
- INS Ephemeris Listing

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TABLE LI

KH-4 FRAME EPHEMERIS

DATA TYPE	FORMAT	UNITS	# CHAR
1. Frame	NNNN		4
2. Z Time	NN NN NN.NNN	HR-MIN-SEC	9
3. DTIM	NNNN	MIN SEC	4
4. Camera Nadir-Lat.	NN NN.NNA	DEG-MIN	7
5. -Lon.	NNN NN.NNA	DEG-MIN	8
6. Format Center-Lat.	NN NNA	DEG-MIN	5
7. -Lon.	NNN NNA	DEG-MIN	6
8. Altitude	NNNNNN	FEET	6
9. Velocity	NNNNN	FEET/SEC	5
10. Azimuth	NNN NN	DEG-MIN	5
11. Sun Angle	ANN NN	DEG-MIN	5
12. Pitch	ANN NN	DEG-MIN	5
13. Variance in Pitch	ANN NN	DEG-MIN	5
14. Roll	ANN NN	DEG-MIN	5
15. Variance in Roll	ANN NN	DEG-MIN	5
16. Yaw	ANN NN	DEG-MIN	5
17. Variance in Yaw	ANN NN	DEG-MIN	5

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TABLE LII

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	DATA TYPE	FORMAT	UNITS	# CHAR
1.	Frame	NNN		3
2.	Camera Start & Speed Up	NNN.N	SECONDS	4
3.	Mode	N		1
4.	Slit	N		1
5.	Roll	NNN.NNN	DEGREES	6
6.	Crab	NN.NNNN	DEGREES	6
7.	Cone Angle	NN.NNNN	DEGREES	6
8.	Commanded Film Velocity	N.NNNN	INCH/SEC	5
9.	Computed Film Velocity	N.NNNN	INCH/SEC	5
10.	Frame Length	NN.NN	FEET	4
11.	Scale Intrack	NNNNNN.		6
12.	Cross Track	NNNNNN.		6
13.	Skew Angle (Ground)	NNN.NNN	DEGREES	6
14.	Skew Angle (Image)	NNN.NNN	DEGREES	6
15.	Altitude	NNNNN	FEET	5
	DATA TYPE (LINE #20)			
16.	System Time	NNNNN.NN	SECONDS	7
17.	Camera Nadir Lat.	NNNN.NNA	DEG-MIN	7
18.	Lon.	NNNNN.NNA	DEG-MIN	8
19.	Principal Ray Lat.	NNNN.NNA	DEG-MIN	7
20.	Lon.	NNNNN.NNA	DEG-MIN	8
21.	Altitude	NNN.NNN	N. MILES	6
22.	Inertial Velocity	NNNNN.NN	FEET/SEC	7
23.	V/H	.NNNN	RAD/SEC	4
24.	Payload Clock	NNNNNNNN	1/10 SEC	8
25.	Vehicle Azimuth	NNN.NNN	DEGREES	6
26.	Prin. Ray Azimuth	NNN.NNN	DEGREES	6
27.	Flight Path Angle	NN.NNNN	DEGREES	6
28.	Sun Angle Elev.	NNN.N	DEGREES	4
29.	Azimuth	NNN.N	DEGREES	4
			TOTAL CHAR/FRAME	158

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TABLE LII cont'd.

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	DATA TYPE	FORMAT	UNITS	# CHAR
		TOTAL CAR/FRAME brought forward		158
30.	Pitch*	ANN NN	DEG-MIN	5
31.	Variance in Pitch	ANN NN	DEG-MIN	5
32.	Roll*	ANN NN	DEG-MIN	5
33.	Variance in Roll	ANN NN	DEG-MIN	5
34.	Yaw*	ANN NN	DEG-MIN	5
35.	Variance in Yaw	ANN NN	DEG-MIN	5
			TOTAL	188

*Reduced Attitude from Stellar/Index

Since there is a line 20 for both camera-on and camera-off time, an additional line 20 must be included in the character count. This brings the frame count for a KH 7 to 261 characters. There is also an additional line #20 at 8 second intervals of camera-on time but the frequency is very low and is not included for estimating purpose.

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TABLE LIII

INS EPHEMERIS DATA

	DATA TYPE	FORMAT	UNITS	# CHAR
1.	Frame	NNNNA		5
2.	Z Time	NN NN NN	HR/MIN/SEC	6
3.	Camera Nadir-Lat.	NN.NNA	DEGREES	5
4.	-Lon.	NNN.NNA	DEGREES	6
5.	Zero Scan-Lat.	NN.NNA	DEGREES	5
6.	-Lon.	NNN.NNA	DEGREES	6
7.	Altitude	NNNNNN	FEET	6
8.	Ground Track Velocity	NNNN	FEET/SEC	4
9.	Ground Track Azimuth	NNN NN	DEG-MIN	5
10.	Solar Elevation	NN NN	DEG-MIN	4
11.	Pitch	A NN NN	DEG-MIN	5
12.	Roll	A NN NN	DEG-MIN	5
13.	Yaw	A NN NN	DEG-MIN	5
14.	V/H	N.NNNN	RAD/SEC	5
			TOTAL CHAR. PER FRAME	72

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their variances are not shown. When the file is structured, each mission will have an addressable header record providing the mission number and mission constants. The next level will be a "pass" header record containing pass number and any relevant pass constants and their variances, when known. The final level (which is the bulk of the MPF) will be the individual frame records shown in the tables. It is anticipated that MCD type information will be available on future systems.

In an automation environment, the MPF may take any one or a combination of several forms. Principally, the forms are a drum-based file, a tape-based file, and simple hard copy listings. 25X1D

a. MPF Hard Copy Form

The MPF currently exists in the form of the KH-4 ephemeris listing, the KH-7 MCD, and the INS ephemeris listing. The hard copy currently supports on-line mensuration by means of teletype entry of the necessary parameters but the corrected attitude from stellar reduction is not integrated directly into the KH-7 MCD requiring reference to two listings for detailed KH-7 mensuration. Presently, for on-line support of KH-4 mensuration, approximately 15 minutes is required to enter the mensuration parameters via a teletype. The hard copy, though it will be infrequently used, is to be retained for a historical record.

b. MPF Tape Form

The computer based MPF allows ready access to mensuration parameters by the identification of the mission, pass, and frame, eliminating the need for manual entry and thereby reducing the potential for human error.

All of the mensuration data for satellite and aircraft (INS) photography is currently available in machine-readable form. The data is either received via the [redacted] or generated in-house from raw data (KH-4 and INS ephemeris listings). A small program will handle the formatting and packing of all mission mensuration parameters into one searchable tape file. This tape file will serve either as the source for a drum stored on-line MPF and when the appropriate tape is mounted, as an on-line file. 25X1D

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operation. The drum file can be built from the tape version and is backed up by it in the event of drum failure.

The drum stored MPF will facilitate the physical computer operation and provide reasonable mensuration support and still share the drum for a variety of other uses. Because the frequency of use of mensuration data decreases with time, it is reasonable to store that which is little used off-line.

Although the actual "cut-off" point must be based on experience gained through IIS operation, a design value of a ten mission drum-stored MPF has been established.

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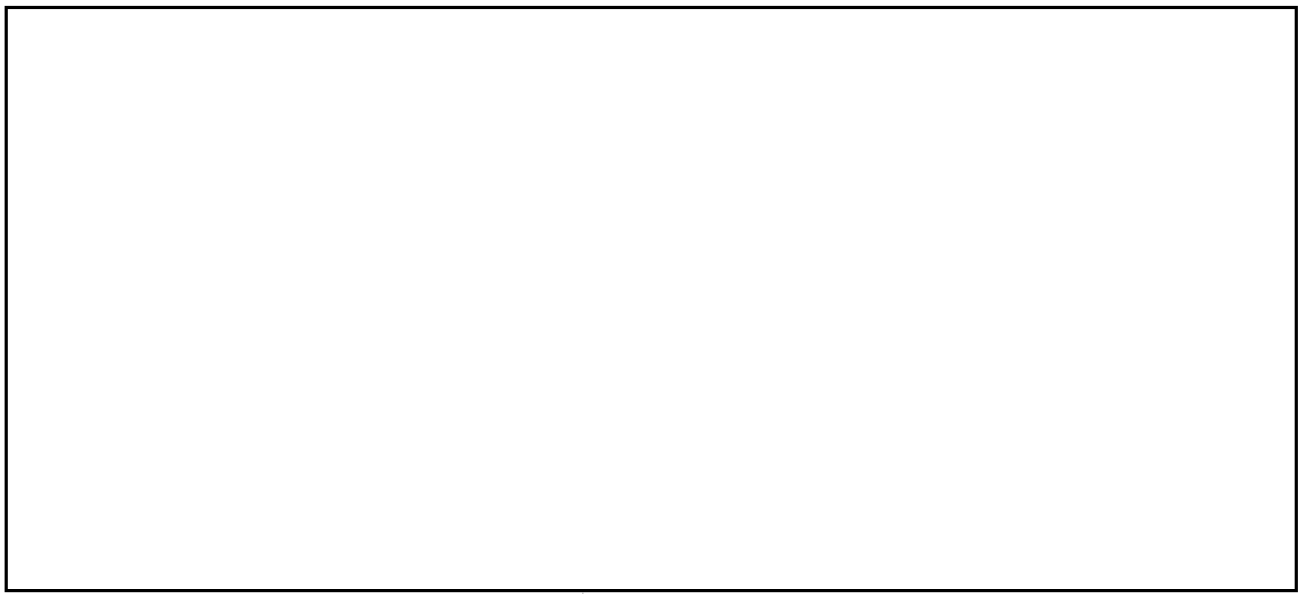

5.3.1.4.3 Size

On the basis of the recommended MPF, approximately 2.8 million characters of on-line drum storage are required.

5.3.1.4.4 Structure

A unit record in the MPF will contain the data pertaining to a single mission. These records will be in chronological order by mission. Each record will be subdivided into the following two sectors which are shown in Table LIV.

a. Camera Constants Sector

This variable length sector will contain the necessary specification for the camera used on the mission. It will not be subdivided.

b. Pass Information Sector

There will be a variable length sector for each pass of the photographic platform. Within each sector there will be a fixed length field for each frame of photography. The fields will include 15 items. The exact contents of each item varies according to the type of photographic platform (i.e. a KH-4

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TABLE LIV

MENSURATION PARAMETERS FILE (MPF)

Sector	Type	Fields	Items
a. Camera Constants	Variable	1 Variable	None
b. Pass Information	Variable	1 Each Pass - Fixed Length	15 Each Frame

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disseminated as a result of imagery exploitation, or in support thereto, and include reports from foreign governments, intelligence agencies and U. S. attaches. The Center's product list, which is included in this file, serves to illustrate the type of input from which these search terms are derived. The list includes:

a) First Phase Reports
b) First Phase Report Supplement
c) Sanitized First Phase Report
d) Briefing Boards
e) Basic Intelligence Support Exploitation Report
f) Frame Ephemeris
g) Photographic Evaluation Report

All such reports are support materials for subsequent imagery exploitation.

5.3.1.5.1 Utilization

The EPDF search terms are used as indices to document files. (It is impractical for these document files, such as the minicard index system, or the library card catalog system, to be incorporated into the IIS). The purpose of these search terms is to provide a limited capability to select support material in a semi-automatic mode, allowing a user to considerably narrow down a large volume of information. Obviously, the process of retrieving the desired product is manual, but the prudent choice of the search terms is germane to the success of identifying the appropriate products.

5.3.1.5.2 Content

The EPDF contains indexes in the form of accession numbers, issuing agency, type of report, title of report and security classification codes. The subject matter, content and scope of each product is indicated by alternate titles, geographic coordinates, country codes and place names. Any of the indexes can be used as search terms as well as geographic coordinates, country code and place name data.

5.3.1.5.3 Size

Because the EPDF is analogous to the All-Source index system, the size of that system can be used as a guide in determining the size of the EPDF. There are 75,500 products represented in the All-Source system with an average of three alternate title-place name entries per product. Each

Growth rate is approximately 11,000 documents per year or 3,520,000 characters. Thus, in five years the size of this file will approach 42,000,000 characters. However, since the value of documents tends to decrease with age, older references can be relegated to secondary levels of storage and only 23,000,000 characters need be kept on-line.

5.3.1.5.4 Structure

The EPDF has a Unit Record for each product. Each unit record is considered as one sector as shown in Table LV.

The Header sector consists of identification indexes such as Title, accession number, security classification code, document originator code, type of report, report number, date of report, mission number, target type, country code, and geographic coordinates. The alternate title field consists of formatted textual entries about the subject matter, content and/or scope of the product as associated with a place name.

5.3.2 Permanent Internal Files

The nine permanent internal IIS files listed below are used in a utility sense to provide input to various IIS programs and provide continuity of information between missions. These files are, in general, quite small and contain no substantive information. Therefore, they are considered as a part of the applicable program specification and listed here only for completeness of information.

1. Target Priorities File
2. Team Specialties File
3. Manhours Per Target
4. Film Use and Location
5. Report Formats
6. Supplementary Data
7. Sterile Targets
8. Basic Intelligence Reports
9. COINS Log

5.3.3 File Structure

This section describes techniques for structuring the IIS data base. Although the discussion uses the Installations Data File as the illustrative example, (because it is the largest and most complex file in the system) the principles which are developed are applicable to all of the files in the

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TABLE LV

EXPLOITATION PRODUCTS DATA FILE (EPDF)

Sector	Type	Fields	Items
Header	Fixed	12 Fixed (Accession number, etc.)	None

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The following definitions shall be applicable:

- Sectoring - Programming term for the subdivision of a file (or data) into smaller workable parts.
- Index - A list of terms that identify a given installation or group of installations.
- Target Index Record (TIR) - A string of location instructions (addresses) used in a control sense to retrieve information from the IDF.
- Target Unit Record (TUR) - A non-contiguous string of data that represents all information about a given installation (target) in the IIS.

A file may be defined as consisting of three parts: the data itself, indexes that provide entry to the file in a variety of ways, and control information that aids in the location of specific data within a file. These three parts are discussed below in terms of the Installations Data File. This file has been chosen as the example since it perhaps represents the greatest amount of data and the greatest degree of complexity. It should be understood that the same principles and procedures, or a subset of them, pertain to all of the files in the IIS.

5.3.3.1 Data

a. Data Sectors

The necessary content of the Installations Data File was presented in Section 5.3.1.1. It was also determined that the data in such a file should be organized by installation. It is convenient to think of the collection of all the data about a given installation as a Target Unit Record (TUR). This TUR contains all the information regarding this target even though portions of the TUR may be scattered throughout the data base and recorded on different storage media, i.e. core, drum, magnetic tape, hard copy. Despite this distribution, the TUR is still considered a total unit and any or all parts of it are retrievable.

Generally speaking, the TUR will not be retrieved in total. Rather, particular parts will be retrieved for particular purposes. Therefore, the TUR record must be divided or sectored, at least logically, in accordance with anticipated use. A typical set of sectors for the TUR is given in

TABLE LVI

TARGET UNIT RECORD SECTORS

Sector	Function	Storage Media
IHEAD	Header	Random
IBRIE	Brief Fixed Facility Description	Random
ICHAN	Changes to Brief Description	Random
IDETA	Detailed Fixed Facility Description	Random
IREAD	Readout Requirements	Random
ICOLL	Collateral	Random
INOTE	Notes	Random
IPHOT	Photo References	Random
ISOUR	Source Data References	Random
IFIXE	Formatted Numerical Readouts (Fixed)	Random
IMOBI	Formatted Numerical Readouts (Mobile)	Random
ICONC	Concise Installation History	Random
ICOMP	Complete Installation History (All Readouts)	Serial Hard copy

b. Storage Media

The "Storage Media" column on the right of Table LVI shows the allocation of TUR parts to various storage media. Sectors allocated random access storage provide a retrieval time on the order of seconds or minutes. Sectors allocated serial access storage require a retrieval response time on the order of several minutes. Sectors placed on hard copy give the requestor a reference number by which to order or request the hard copy history.

c. Access to TUR Sectors

Assuming that the TUR is divided into sectors as described above a method must be provided for tying the entire record together and locating its various parts.

This is accomplished by providing an index (called a Target Index Record (TIR)) for each TUR, or installation. This TIR contains the starting address (storage location) of each sector of the TUR. A typical TIR for the TUR shown in Table LVI is given in Table LVII.

The use of a TIR provides the following advantages:

- All addressing information about the TUR is in one place, facilitating the retrieval of TUR sectors in random order, i.e. search is not required, any sector can be retrieved by direct addressing.
- System response time can be improved by putting the TIR's for the high activity TUR's in core rather than on the drum.
- All control information is in one small, concise block thus facilitating maintenance activity including the movement of TUR sectors within and among the various storage media.

d. TIR Size

A conservative estimate of the size of a single TIR is based on fifteen words (only twelve are indicated on Table LVII)of 30 bits each. Thirty bits can designate any one of 10^9 storage locations. Thus, a single TIR requires 450 bits. Assuming capacity for 50,000 targets, 2.25×10^7 bits of storage are required for a complete set of TIR's.

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TABLE LVII

TYPICAL TIR

Word 0	Drum Unit No., Drum Address of	IHEAD
Word 1	" "	IBRIE
Word 2	" "	ICHAN
Word 3	" "	IDETA
Word 4	" "	IREAD
Word 5	" "	ICOLL
Word 6	" "	INOTE
Word 7	" "	IPHOT
Word 8	" "	ISOUR
Word 9	" "	IFIXE
Word 10	" "	IMOBI
Word 11	" "	ICONC
Word 12	Tape No., File No., Record No. of	ICOMP

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5.3.3.2 File Indexes

a. Index Types

The TIR described in Section 5.3.3.1 provides an index to the location of data within a TUR. It is also necessary to provide an index to the location of the TIR's. It should be possible to enter this index in a number of ways, e.g. by place name, COMIREX number, BE number, NPIC number. In addition, it may be desirable to maintain lists of targets ordered by certain classes such as country, type of installation, geographic coordinates, etc. Therefore, two types of indexes will be maintained, i.e. Unique Term Indexes and Broad Term Indexes. The former is a one-to-one index that translates from one installation designator to another. The latter is a one-to-many index that gives all the installations in a given class.

The possible indexes by category type are:

Type	Name	Order - Alphabetical or Numeric
Unique Term	Target Name	A
"	COMIREX Number	N
"	Bombing Encyclopedia Number	N
"	WAC/PIC Number	N
Broad Term	Country	A (2 letter code)
"	Geo-coordinates	N (by 1^{o} squares)
"	Military District	N
"	Target Type	A

b. Index Form

The function recorded in the indexes described above can take one of two forms. It can be either a pointer, or reference, to the storage location of the appropriate TIR(s) or the TIR(s) itself. If the complete TIR is recorded in the index, access time is reduced because one access to storage provides the address of the desired sector within the TUR. However, this requires more storage since each TIR must be repeated for each index, i.e. ten indexes require ten sets of TIR's, or 2.4×10^{8} bits of storage.

If only the storage location of the TIR is recorded in the indexes, two storage accesses are required to retrieve data from the TUR using the indexes, once to get the address of the TIR and a second time to retrieve

- For a large percentage of the accesses to the TUR, e.g. during immediate readout, the installation can be referred to by a reference number corresponding to the storage location of its TIR.

- It probably develops that the major use of the Broad Term Indexes is to provide lists of installations as inputs to Boolean statements to answer questions such as "How many MIG's have been seen in North Korea?"

c. Machine Reference Number

Each installation will be assigned a unique machine reference number that is in turn directly translatable to the address (storage location) of the TIR. It would be convenient if one of the existing target number systems could be used as the basis for establishing the machine reference numbers. However, none of them form a closed set of numbers of convenient size, nor does it appear possible to develop a simple algorithm to relate either of the existing systems to storage locations. Therefore, all installations will be assigned a machine reference number that gives the address of the corresponding TIR. However, if it develops that the system is significantly bound by the number of index lookups, it may be desirable to develop an algorithm of some complexity to relate machine reference numbers to a more familiar installation designator such as WAC/PIC number.

d. Index Search

Search of the Unique Term Indexes presents no great problem since all entries in the index can be the same size. However, if the one-to-many construction is used with the Broad Term Indexes, search becomes more difficult. This difficulty can be avoided, at the cost of access time, by having the function that is recorded with a broad index term be a reference to a list of installations falling in that class. In this way all terms in the Broad Term Indexes will also be the same size. The penalty is that two storage accesses are required to obtain the list of installations falling in a class, e.g. country, one to get the address of the list and a second to get the list itself. However, the simpler search more than compensates for this penalty.

e. Index Size

Estimates of the sizes of the various indexes are given in Tables

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TABLE LVIII

UNIQUE TERM INDEXES

Index	Bits/Argument	Bits/Function	No. of Entries	No. of Bits
Target Number	210	30	50,000	12.0×10^6
COMIREX Number	40	30	5,000	$.35 \times 10^6$
BE Number	36	30	20,000	1.32×10^6
NPIC Number	48	30	50,000	3.9×10^6
			TOTAL	17.6×10^6

TOP SECRET

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TOP SECRET

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TABLE LIX

BROAD TERM INDEXES

Index	Bits/ Argument	Bits/ Function	No. of Entries	Bits in List	Total Bits
Country	12	30	100	1.5×10^6	1.50×10^6
Geographic Coordinates (1^o squares)	--	30	65,000	1.5×10^6	3.45×10^6
Military District	24	30	2,000	1.5×10^6	1.51×10^6
Target Type	12	30	200	1.5×10^6	1.50×10^6
				TOTAL	7.96×10^6

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the address of the appropriate TIR in the Unique Term Indexes and the address of the appropriate list in the Broad Term Indexes. The lists associated with the Broad Term Indexes (Table LIX) were taken to consist of the addresses of the appropriate TIR's. It was assumed that each installation fell under one of the terms in each Broad Term Index. Thus the sum of the lists associated with any Broad Term Index includes all installations and must consist of 30 bits x 50,000 entries, or 1.5×10^6 bits.

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